NOTICE: This document contains references to Varian. Please note that Varian, Inc. is now part of Agilent Technologies. For more information, go to **www.agilent.com/chem.**

Agilent Technologies

Dual Controller

Models

929-7000 **929-7001**
929-7002 **929-7003**
929-7004 **929-7005**
929-7006 **929-7007**
929-7008 **929-7009**
929-7010 **929-7011**
929-7012 **929-7013**
929-7014 **929-7015**

(I) MANUALE DI ISTRUZIONI

(D) BEDIENUNGSHANDBUCH

(F) NOTICE DE MODE D'EMPLOI

(GB) INSTRUCTION MANUAL

87-900-094-01 (H)
APRIL 2007

DUAL Controller

VARIAN

vacuum technologies

Dear Customer,

Thank you for purchasing a VARIAN vacuum product. At VARIAN Vacuum Technologies we make every effort to ensure that you will be satisfied with the product and/or service you have purchased.

As part of our Continuous Improvement effort, we ask that you report to us any problem you may have had with the purchase or operation of our product. On the back side you find a Corrective Action Request form that you may fill out in the first part and return to us.

This form is intended to supplement normal lines of communications and to resolve problems that existing systems are not addressing in an adequate or timely manner.

Upon receipt of your Corrective Action Request we will determine the Root Cause of the problem and take the necessary actions to eliminate it. You will be contacted by one of our employees who will review the problem with you and update you, with the second part of the same form, on our actions.

Your business is very important to us. Please, take the time and let us know how we can improve.

Sincerely.

Sergio PIRAS

Vice President and General Manager
VARIAN Vacuum Technologies

Note: Fax or mail the Customer Request for Action (see backside page) to VARIAN Vacuum Technologies (Torino) - Quality Assurance or to your nearest VARIAN representative for onward transmission to the same address.

CUSTOMER REQUEST FOR CORRECTIVE / PREVENTIVE / IMPROVEMENT ACTION

TO : VARIAN VACUUM TECHNOLOGIES TORINO - QUALITY ASSURANCE

FAX N° : XXXX - 011 - 9979350

ADDRESS: VARIAN S.p.A. - Via F.lli Varian, 54 - 10040 Leinì (Torino) - Italy

E-MAIL : marco.marzio@varianinc.com

NAME	COMPANY	FUNCTION

ADDRESS :

TEL. N° : FAX N° :

E-MAIL :

PROBLEM / SUGGESTION :

REFERENCE INFORMATION (model n°, serial n°, ordering information, time to failure after installation, etc.) :

DATE

CORRECTIVE ACTION PLAN / ACTUATION (by VARIAN VTT) LOG N°

XXXX = Code for dialing Italy from your country (es. 01139 from USA; 00139 from Japan, etc.)

VARIAN

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INFORMAZIONI GENERALI

Questa apparecchiatura è destinata ad uso professionale. L'utente deve leggere attentamente il presente Manuale di istruzioni ed ogni altra informazione addizionale fornita dalla Varian prima dell'utilizzo dell'apparecchiatura. La Varian declina ogni responsabilità dovuta alla mancata osservanza totale o anche parziale delle istruzioni fornite in questo documento, all'uso improprio dell'apparecchiatura da parte di personale non addestrato, all'esecuzione di interventi non autorizzati o alla mancata osservanza delle specifiche normative nazionali.
Nei paragrafi seguenti sono riportate tutte le informazioni necessarie a garantire la sicurezza dell'operatore durante l'utilizzo dell'apparecchiatura. Nel appendice "Technical Information" vengono fornite delle informazioni dettagliate.

Questo manuale utilizza le seguenti convenzioni:

PERICOLO!

I messaggi di pericolo attirano l'attenzione dell'operatore su una procedura o una pratica specifica che, se non eseguita in modo corretto, potrebbe provocare gravi lesioni personali.

ATTENZIONE

I messaggi di attenzione sono visualizzati prima di procedure che, se non osservate, potrebbero causare danni all'apparecchiatura.

NOTA

Le note contengono informazioni importanti estrapolate dal testo.

DESCRIZIONE DEL CONTROLLER

Il controller Dual della Varian è un controller, per le pompe ioniche, modulare e flessibile. L'unità è configurata in fabbrica a seconda delle esigenze del cliente.

Il controller Dual è disponibile con:

- Pannello frontale con tastierina, display (16x2) e scheda processore.
- Scheda di I/O remoto.
- Scheda di comunicazione seriale (opzionale).
- Alimentatore da 24 Vcc, 20 W, per il misuratore Eyesys Gauge (opzionale).
- Scheda di alimentazione con DSP integrato per la gestione delle tensioni in uscita.
- Scheda(e) di alta tensione.

Le configurazioni disponibili sono elencate di seguito:

DESCRIZIONE	PART NUMBER
Modelli Dual	
Unità base da 120 Vca con 1 scheda alta tensione negativa	929-7000
Unità base da 120 Vca con 2 schede alta tensione negative	929-7001
Unità base da 120 Vca con 1 scheda alta tensione positiva	929-7002
Unità base da 120 Vca con 2 schede alta tensione positive	929-7003
Unità base da 230 Vca con 1 scheda alta tensione negativa	929-7004
Unità base da 230 Vca con 2 schede alta tensione negative	929-7005
Unità base da 230 Vca con 1 scheda alta tensione positiva	929-7006
Unità base da 230 Vca con 2 schede alta tensione positive	929-7007
Unità base da 120 Vca con 1 scheda alta tensione negativa e 1 scheda RS232	929-7008
Unità base da 120 Vca con 2 schede alta tensione negative e 1 scheda RS232	929-7009
Unità base da 120 Vca con 1 scheda alta tensione positiva e 1 scheda RS232	929-7010
Unità base da 120 Vca con 2 schede alta tensione positive e 1 scheda RS232	929-7011
Unità base da 230 Vca con 1 scheda alta tensione negativa e 1 scheda RS232	929-7012
Unità base da 230 Vca con 2 schede alta tensione negative e 1 scheda RS232	929-7013
Unità base da 230 Vca con 1 scheda alta tensione positiva e 1 scheda RS232	929-7014
Unità base da 230 Vca con 2 schede alta tensione positive e 1 scheda RS232	929-7015

Il controller Dual è in grado di gestire fino a due pompe ioniche. dalla 20 l/s alla 500 l/s, con polarità positiva o negativa. Permette di eseguire delle letture affidabili di pressione fino a 10^{-11} Torr ottimizzando quindi le prestazioni della pompa sull'intero campo operativo.

Con due misuratori Eyesys opzionali, è possibile eseguire letture di pressione con differenti precisioni e campi di musura.

Il controller Dual può essere gestito nelle modalità LOCAL, REMOTE I/O e SERIAL attraverso le interfacce RS 232-422 e 485 (le interfacce RS422 e RS485 sono opzionali).

NOTA

Contattare l'ufficio vendite della Varian per ordinare i sistemi con RS 422/485 e misuratori Eyesys.

Le modalità con cui i comandi operativi vengono impartiti al sistema dipendono dalla modalità operativa in cui si trova il controller:

- Nella modalità LOCAL, tutti i comandi vengono impartiti attraverso il pannello frontale.
- Nella modalità REMOTE I/O, tutti i comandi vengono impartiti attraverso segnali I/O remoti (relay contacts) direttamente sul connettore Remote Control posto sul pannello posteriore.
- Nella modalità SERIAL, tutti i comandi vengono impartiti attraverso un personal computer locale collegato all'interfaccia RS 232-422-485.

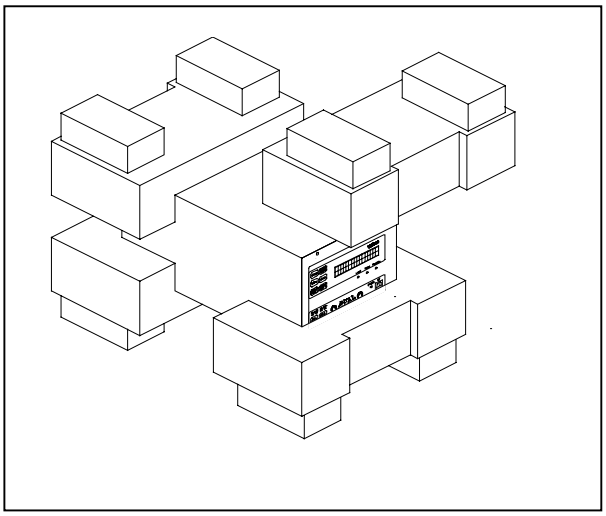
IMMAGAZZINAMENTO

Per trasportare e immagazzinare il controller occorre osservare le seguenti condizioni ambientali:

- Temperatura: da -20 °C a +70 °C
- Umidità relativa: da 0 a 95% (senza condensa)

PREPARAZIONE PER L'INSTALLAZIONE

Il controller viene fornito in un imballo protettivo speciale; nel caso in cui si presentassero segni di danni che potrebbero essere stati causati durante il trasporto, contattare l'ufficio vendite locale.
Durante l'operazione di disimballo, prestare particolare attenzione a non lasciar cadere il controller e a non sottoporlo ad urti.
Il materiale dell'imballo è completamente riciclabile e risponde alla direttiva CEE 85/399 per la tutela dell'ambiente.



Imballo del controller

Il controller Dual è configurato in fabbrica per funzionare con le seguenti tensioni di alimentazione:

- Modelli 929-7000/1/2/3 e 929-7008/09/10/11, tensione di ingresso da 100 a 120 Vac, frequenza di 50/60 Hz,
- Modelli 929-7004/5/6/7 e 929-7012/13/14/15; Tensione di ingresso da 200 a 240 Vac, frequenza di 50/60 Hz.

INSTALLAZIONE

PERICOLO!

Il controller Dual è provvisto di un cavo di alimentazione a 3 fili dotato di spina approvata a livello internazionale. Utilizzare sempre questo cavo di alimentazione, inserendo la spina in una presa di alimentazione munita di collegamento a terra onde evitare scariche elettrostatiche.
All'interno del controller si sviluppano delle alte tensioni che possono provocare delle lesioni gravi o addirittura la morte. Prima di eseguire qualsiasi operazione di installazione o manutenzione del controller, scollegarlo dalla presa elettrica.

ATTENZIONE!

Il controller può essere utilizzato sia come unità da tavolo che come modulo installato in un rack. In ogni caso deve essere posizionato in modo tale che l'aria possa circolare liberamente attraverso i fori di areazione presenti sulla copertura.
Nel caso in cui il controller viene utilizzato come modulo rack, DEVE essere installato in un'adattatore alto quattro unità rack per evitare che cada all'interno del rack stesso. Il pannello frontale del controller Dual non è previsto per reggere il peso dell'unità.
Non installare o utilizzare il controller in ambienti esposti ad agenti atmosferici (pioggia, neve, ghiaccio), nella presenza di polvere, gas corrosivi o in ambienti esplosivi o ad alto rischio di infiammabilità.

NOTA

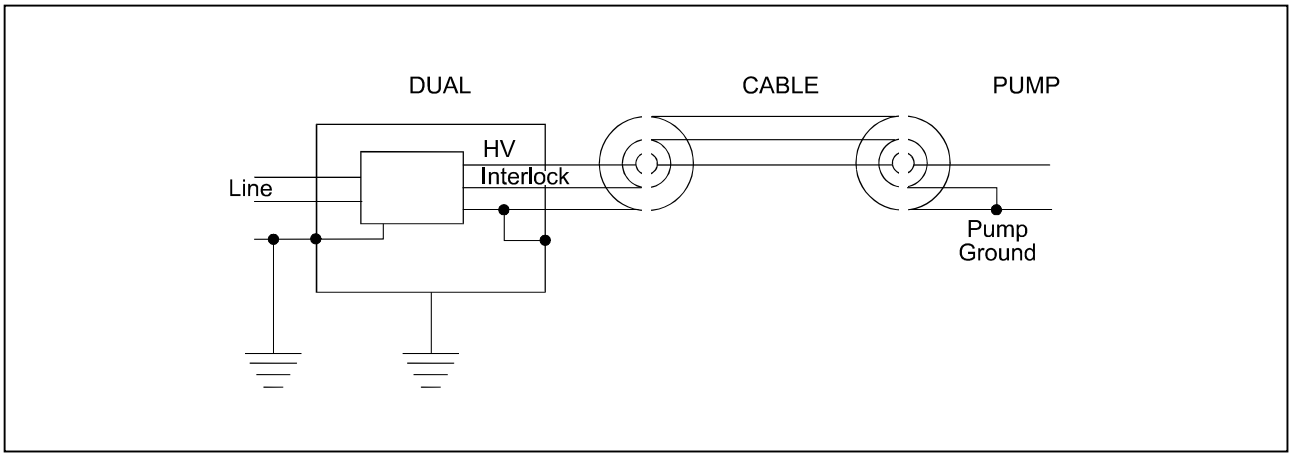
Nel caso in cui il controller viene installato in un rack, rimuovere i quattro piedini in modo che venga posizionato con almeno 30 mm di spazio sotto e sopra.

Durante il funzionamento, occorre che siano rispettate le seguenti condizioni ambientali:

- Temperatura: da 0 °C a +45 °C
- Umidità relativa: 0 - 90% (senza condensa)

Per collegare il controller alla pompa, utilizzare il cavo specifico disponibile come opzione.

Fare riferimento all'appendice "Technical Information" per informazioni dettagliate su questi ed altri collegamenti.



Collegamenti delle masse

NOTA

L'interlock del cavo viene chiuso sulla massa della pompa. Se il collegamento è interrotto l'alta tensione viene disabilitata. Chiudere l'interlock con l'apposito contro-connettore se si utlizza un cavo senza connettore di interlock.

USO

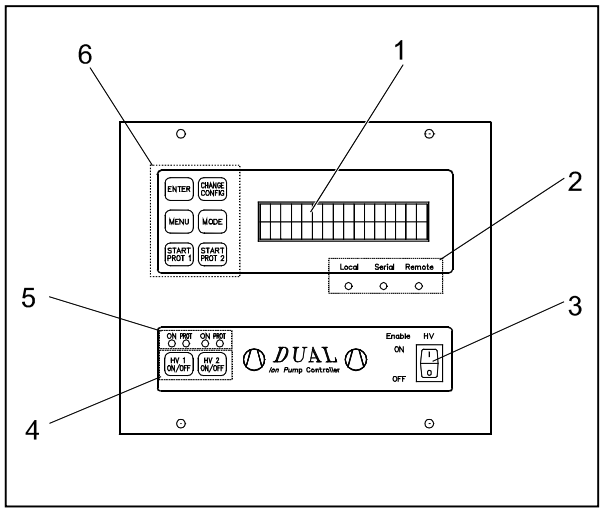
In questo paragrafo vengono riportate le principali procedure operative. Per ulteriori informazioni e per le procedure riguardanti collegamenti o particolari opzioni fare riferimento al paragrafi "UTILIZZO" nell'appendice "Technical Information".
Prima di utilizzare il controller effettuare tutti i collegamenti elettrici e pneumatici e fare riferimento al manuale della pompa collegata.

PERICOLO!

Per evitare danni alle persone ed all'apparecchiatura, nel caso in cui la pompa debba essere posizionata su di un tavolo assicurarsi che quest'ultimo sia stabile. Non mettere mai in funzione la pompa se la flangia di ingresso non è collegata al sistema o se non è chiusa con la flangia di chiusura.

Controlli ed indicatori del pannello frontale del controller Dual

Nella seguente figura viene riportato il pannello frontale del controller Dual. La tabella che segue indica la definizione e la funzionalità dei controlli e indicatori.



Pannello frontale

Legenda:

1. Display a cristalli liquidi retro illuminato, 16 caratteri x 2 righe

2. LED verdi che indicano la modalità operativa selezionata:

   - LED Local acceso quando è selezionata la modalità operativa LOCAL
   - LED Serial acceso quando è selezionata la modalità operativa SERIAL
   - LED Remote acceso quando è selezionata la modalità operativa REMOTE I/O

3. Interruttore HV ENABLE, attivo indipendentemente dalla modalità operativa selezionata. Per alimentare l'alta tensione dal pannello di controllo, dal Remote I/O o dalla linea seriale, occorre che l'interruttore HV ENABLE sia predisposto nella posizione ON.

4. Pulsanti HV1 on/off e HV2 on/off, utilizzati per abilitare/disabilitare la funzionalità dei circuiti di alta tensione.

5. LED; quando è acceso il LED ON il relativo circuito HV (alta tensione) è abilitato, mentre quando è acceso il LED PROT è stata selezionata la modalità operativa per la pompa corrispondente.

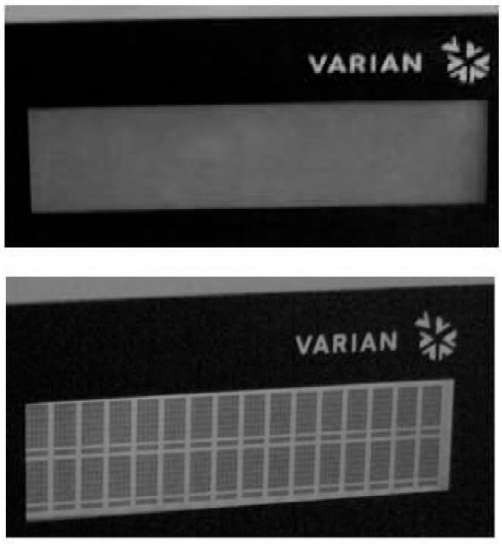
6. Gruppo di sei pulsanti di funzione con le seguenti caratteristiche:

   - Pulsante ENTER, utilizzato per confermare una selezione che è stata effettuata con il pulsante CHANGE
   - Pulsante CHANGE CONFIG, utilizzato per visualizzare tutte le opzioni disponibili
   - Pulsante MENU, utilizzato per entrare nel menu di configurazione
   - Pulsante MODE, utilizzato per selezionare la modalità operativa
   - Pulsanti START PROT 1 e START PROT 2, utilizzati per selezionare la modalità Start Protect per la pompa corrispondente.

Procedura di regolazione del contrasto dello schermo LCD del Controller a pompa ionica "DUAL"

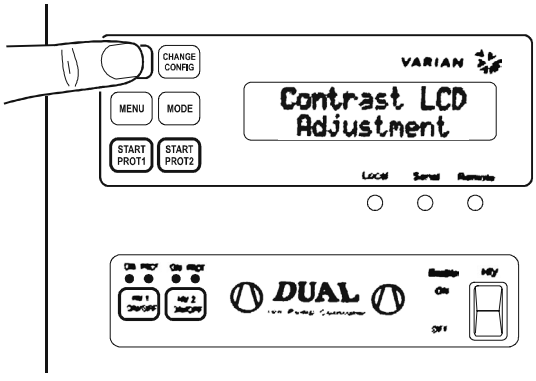
Il Controller a pompa ionica "DUAL" è dotato di uno schermo LCD, installato nel pannello anteriore dell'unità. Il contrasto del display, nonostante sia impostato dalla fabbrica, necessiterà di essere regolato qualora si verifichi una delle seguenti condizioni:

- La retroilluminazione è attiva, ma sul display non è visualizzato nessun carattere.
- La retroilluminazione è attiva, ma sul display è visualizzata una matrice a quadretti neri.



È necessario eseguire la procedura di regolazione

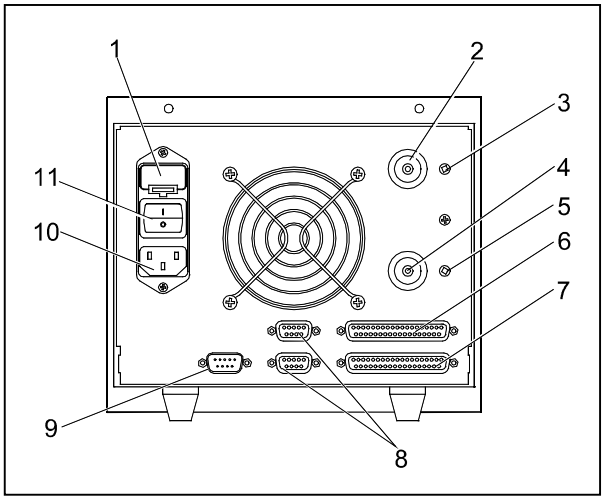
Per eseguire la procedura di regolazione del contrasto del display, accendere il controller e, al termine dell'inizializzazione, premere il tasto ENTER collocato sul pannello anteriore, tenendolo premuto fino a quando non è ottenuta l'impostazione desiderata. Rilasciando il pulsante "ENTER", il valore di contrasto sarà salvato nella memoria dell'unità



Quando l'unità accede alla "modalità di regolazione del contrasto", il display visualizza il relativo messaggio e i LED del display iniziano a lampeggiare.

Pannello posteriore del controller Dual

La seguente figura riporta i controlli e connettori sul pannello posteriore del controller Dual. La configurazione riportata nella figura consiste in due schede ad alta tensione (HV), due schede Set Point/Remote Control, una scheda d'interfaccia RS 232/422 ed il collegamento a due misuratori Eyesys.



Pannello posteriore

1. Sede porta fusibile
2. Connettore Fischer HV2
3. Bloccaggio del cavo HV sul connettore HV2
4. Connettore Fischer HV1
5. Bloccaggio del cavo HV sul connettore HV1
6. Connettore a 37-pin per Remote I/O HV2
7. Connettore a 37-pin per Remote I/O HV1
8. Connettori a 9-pin per misuratori Eyesys multipli
9. Connettore d'interfaccia seriale a 9-pin
10. Presa di alimentazione
11. Interruttore di alimentazione principale

PROCEDURE OPERATIVE

Modalità operative

Il Dual controller può funzionare nelle seguenti modalità:

- LOCAL
- REMOTE I/O (input/output)
- SERIAL.

Nella modalità LOCAL tutti i comandi sono attivati dal pannello frontale.

Nella modalità REMOTE I/O tutti i comandi sono attivati da un personal computer remoto collegato tramite il connettore di input/output collocato sul pannello posteriore.

Nella modalità SERIAL tutti i comandi sono attivati da un personal computer esterno collegato tramite l'interfaccia seriale RS 232-422-485.

NOTA

La modalità operativa selezionata viene memorizzata dal sistema e quindi al ripristino della tensione in seguito alla sua caduta, il controller Dual ritornerà nella modalità operativa nella quale era al momento dalla caduta di tensione.

NOTA

Quando viene selezionata una qualsiasi modalità operativa, il sistema accetterà solamente i comandi della relativa modalità però è in grado di visualizzare informazioni e acquisire segnali e dati contemporaneamente da tutte le interfacce.

L'unità è progettata per funzionare nelle seguenti modalità:

- modalità START
- modalità PROTECTED

Nella **modalità START** il controller fornisce tutta la potenza, indipendentemente dalle condizioni della pompa, fino a raggiungere la corrente di corto circuito. Questa modalità di funzionamento deve essere utilizzata per avviare la pompa ad alta pressione.

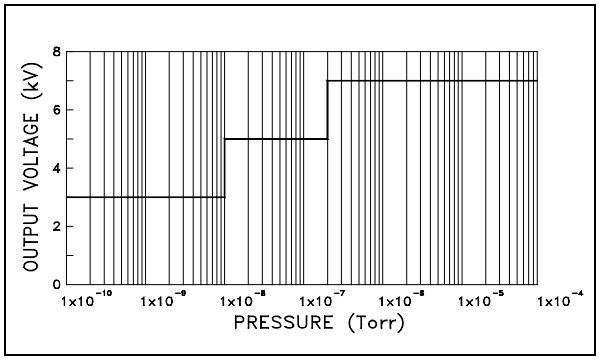
Nella **modalità PROTECTED** il controller limita la corrente in uscita e spegne l'alta tensione quando il valore di corrente supera la corrente di soglia per oltre 0,2 secondi.

In condizioni di normale funzionamento, questa è la modalità preferita in quanto, in caso di guasto alla pompa ionica o al cavo causato da corto circuito o alto carico, l'alta tensione si spegnerà.

Fare riferimento "Technical Information" per informazioni dettagliate sulle modalità operative.

Modalità operativa Step

La modalità Step deve essere scelta alfine di ottimizzare le prestazioni della pompa e consentire le letture a pressione molto bassa senza influenzare la corrente di dispersione.
Nella modalità Step il controller Dual sceglie la tensione in uscita più appropriata secondo la pressione all'interno della pompa (vedere la figura seguente).



Cambiamento della tensione in uscita vs pressione

Accensione del controller dal pannello frontale (modalità LOCAL)

NOTA

Per accendere l'alta tensione (HV) occorre che l'interlock esterno sia chiuso (connettore inserito). Nel caso in cui non venga eseguita alcuna connessione esterna, inserire i ponticelli di chiusura e interlock forniti con l'unità.

Procedere come segue per alimentare il controller e abilitare la tensione sui connettori di alta tensione (H.V.):

- Inserire il cavo proveniente dalla pompa ed il pin di interlock loopback del cavo H.V. nei relativi connettori sul pannello posteriore.
- Predisporre l'interruttore di alimentazione sul pannello posteriore nella posizione di ON.
- Predisporre l'interruttore ENABLE HV sul pannello anteriore nella posizione ON.
- Premere i pulsanti HV 1/2 ON/OFF (LED ON si accende).

NOTA

Con un solo circuito H.V. installato entrambe le righe del display sono dedicate alla pompa numero uno, mentre con due circuiti installati ogni riga è dedicata ad una pompa diversa.

Avvio della pompa

Per avviare la pompa, premere il relativo pulsante HV ON/OFF; si accenderà il LED ON.

Spegnimento della pompa

Per fermare la pompa, premere il relativo pulsante HV ON/OFF; si spegnerà il LED ON.

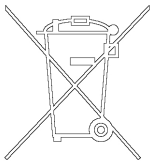
MANUTENZIONE

Il controller Dual non richiede alcun intervento di manutenzione. Qualsiasi tipo di intervento sull'unità deve essere eseguito da personale tecnico autorizzato.
In caso di guasto è possibile usufruire del servizio di riparazione Varian o del "Varian advanced exchange service", che permette di ottenere un controller rigenerato in sostituzione di quello guasto.

Qualora un controller dovesse essere rottamato, procedere nel rispetto delle normative nazionali specifiche.

SMALTIMENTO

Significato del logo "WEEE" presente sulle etichette.
Il simbolo qui sotto riportato è applicato in ottemperanza alla direttiva CE denominata "WEEE". Questo simbolo **(valido solo per i paesi della Comunità Europea)** indica che il prodotto sul quale è applicato, NON deve essere smaltito insieme ai comuni rifiuti domestici o industriali, ma deve essere avviato ad un sistema di raccolta differenziata. Si invita pertanto l'utente finale a contattare il fornitore del dispositivo, sia esso la casa madre o un rivenditore, per avviare il processo di raccolta e smaltimento, dopo opportuna verifica dei termini e condizioni contrattuali di vendita.



MESSAGGI DI ERRORE

Per certi tipi di guasti il controller esegue un test di autodiagnostica e visualizza uno dei seguenti messaggi riportati nella tabella seguente.

MESSAGGIO	DESCRIZIONE	AZIONE CORRETTIVA
GUASTI DELL'ALTA TENSIONE 1 O 2		
HV(X) ERROR PANEL INTERLOCK	L'alta tensione (HV) è stata spenta da un interlock ricevuto dal pannello frontale o dalla copertura. (l'interruttore "HV ENABLE" predisposto su OFF oppure copertura rimossa dall'unità)	1. Impostare l'interruttore "HV ENABLE" su ON e ripetere la procedura di accensione dell'alta tensione (H.V.). 2. Assicurarsi che la copertura sia installata correttamente.
HV(X) ERROR REMOTE INTERLOCK	L'alta tensione (HV) è stata spenta da un interlock ricevuto dal Remote I/O.	1. Controllare che siano installati gli interruttori di richiusura con relativi interlock esterni ponticellati. 2. Assicurarsi che l'interlock esterno sia chiuso.
HV(X) ERROR CABLE INTERLOCK	L'alta tensione (HV) è stata spenta a causa di un interlock del cavo HV.	1. Nel caso in cui la pompa utilizza un cavi HV con interlock di sicurezza, controllare che il connettore all'estremità della pompa sia inserito correttamente e che il pin di richiusura all'estremità dell'unità sia inserito nel relativo connettore sul pannello posteriore. 2. Nel caso in cui la pompa utilizza un cavo HV a polo singolo senza interlock, controllare che il ponticello sia correttamente inserito tra la presa del cavo HV interlock e la terra.
HV(X) ERROR HV NOT FOUND	Non è stato rilevato il circuito di alta tensione (HV).	Ripetere la procedura di accensione del Dual; se il problema persiste, contattare Varian per la riparazione o sostituzione.
HV(X) ERROR HV FAULT	L'alta tensione (HV) è stata spenta a causa di un guasto nel circuito HV.	Contattare Varian per la riparazione o sostituzione.
HV(X) ERROR HV OVERTEMP.	I sensori di temperatura all'interno del controller Dual hanno rilevato una temperatura che va oltre i limiti di sicurezza.	1. Assicurarsi che la temperatura ambientale durante il funzionamento del controller non sia superiore ai 45 º. 2. Assicurarsi che i fori di aerazione sulla copertura non siano ostruiti. 3. Assicurarsi che le palette della ventola girino liberamente e che l'aria coinvogliata all'interno del controller Dual non sia ostruita da polvere o da materiale estraneo. Attendere qualche minuto in modo che la temperatura interna dell'unità si raffreddi e quindi ripetere la procedura di accensione dell'alta tensione (H.V.)
HV(X) ERROR REMOTE I/O NOT FOUND	Non è stata rilevata la scheda Remote I/O.	Ripetere la procedura di accensione del Dual; se il problema persiste, contattare Varian per la riparazione o sostituzione.
HV(X) ERROR R. I/O FAULT	Guasto al circuito Remote I/O.	1. Assicurarsi che i connettori esterni Remote I/O siano collegati come descritto in questo documento. 2. Ripetere la procedura di accensione del Dual; se il problema persiste, contattare Varian per la riparazione o sostituzione.
HV(X) ERROR PROTECT	È scattata la protezione di sovracorrente quando è stata selezionata la modalità operativa "PROTECT".	Nel caso fosse necessario, selezionare la modalità START in modo che il controller possa operare fino al raggiungimento della corrente di corto circuito.
HV(X) ERROR SHORT CIRCUIT	È stato rilevato un corto circuito sull'uscita H.V.	1. Controllare l'integrità del cavo dell'alta tensione (H.V.). 2. Rimuovere il cavo dalla pompa ionica e assicurarsi che non ci sia un corto circuito nella pompa o nel cavo.

MESSAGGIO	DESCRIZIONE	AZIONE CORRETTIVA
HV(X) ERROR OVER VOLT/CURR	Sono stati rilevati dei valori errati di tensione e corrente sull'uscita H.V. Questo errore indica un guasto del circuito di controllo H.V.	Ripetere la procedura di accensione del Dual; se il problema persiste, contattare Varian per la riparazione o sostituzione.
HV(X) ERROR ZERO MEAS	Il microprocessore del controller Dual ha rilevato che sia la tensione che la corrente non sono presenti sull'uscita H.V. che doveva essere attiva.	Ripetere la procedura di accensione del Dual; se il problema persiste, contattare Varian per la riparazione o sostituzione.
ERRORI DI FUNZIONAMENTO DEI MISURATORI 1 O 2		
GAUGE(X) ERROR PANEL INTERLOCK	L'interruttore "HV ENABLE" è predisposto su OFF oppure la copertura è stata rimossa dall'unita.	1. Predisporre l'interruttore "HV ENABLE" su ON e quindi ripetere la procedura di accensione. 2. Assicurarsi che la copertura sia installata correttamente.
GAUGE(X) ERROR GAUGE NOT FOUND	Il microprocessore non rileva l'HW di gestione misuratore.	Spegnere l'alimentatore del controller Dual quindi riaccenderlo. Se il problema persiste, contattare Varian per la riparazione o sostituzione.
GAUGE(X) ERROR GAUGE FAULT	È stato rilevato un malfunzionamento nel misuratore Eyesys collegato.	1. Controllare il cavo di collegamento tra il controller Dual ed il misuratore. 2. Assicurarsi che il misuratore funzioni correttamente quando è scollegato dal controller Dual. Se il problema persiste, contattare Varian per la riparazione o sostituzione.
GAUGE(X) ERROR GAUGE NOT CONNECT	Il misuratore è stato scollegato dal controller Dual.	Ricollegare il misuratore e ripetere la procedura di alimentazione.
SYSTEM ERRORS		
SYSTEM ERROR ER 1 ÷ 10	Ad uso del Supporto tecnico Varian per la diagnostica. Spegnere e riaccendere il controller Dual; se il problema persiste, contattare Varian per la riparazione o sostituzione.	

ALLGEMEINES

Dieser Apparat ist für Fachbetriebe bestimmt. Vor Gebrauch sollte der Benutzer dieses Handbuch sowie alle weiteren mitgelieferten Zusatzdokumentationen genau lesen. Bei Nichtbeachtung - auch teilweise - der enthaltenen Hinweise, unsachgemäßem Gebrauch durch ungeschultes Personal, nicht autorisierten Eingriffen und Mißachtung der einheimischen, hier zur Geltung kommenden Bestimmungen übernimmt die Firma Varian keinerlei Haftung.
In den folgenden Abschnitten sind alle erforderlichen Informationen für die Sicherheit des Bedieners bei der Anwendung des Geräts aufgeführt. Detaillierte technische Informationen sind im Anhang "Technical Information" enthalten.

In dieser Gebrauchsanleitung werden Sicherheitshinweise folgendermaßen hervorgehoben:

GEFAHR!

Die Gefahrenhinweise lenken die Aufmerksamkeit des Bedieners auf bestimmte Vorgänge oder Praktiken, die bei unkorrekter Ausführung schwere Verletzungen hervorrufen können.

ACHTUNG

Die Warnhinweise vor bestimmten Prozeduren machen den Bediener darauf aufmerksam, daß bei Nichteinhaltung Schäden an der Anlage entstehen können.

ANMERKUNG

Die ANMERKUNGEN enthalten wichtige Informationen, die im Text hervorgehoben werden.

BESCHREIBUNG DES CONTROLLERS

Der Dual-Controller der Firma Varian ist ein Gerät zur Steuerung von flexiblen Ionenpumpen, das nach den spezifischen Angaben des Kunden fabrikseitig vorkonfiguriert wird.

Der Dual-Controller kann in folgender Konfiguration geliefert werden:

- Vordere Schalttafel mit Tastenfeld, Display (16x2) und Mikroprozessor-Karte
- Fern-E/A-Karte
- Karte für seriellen Datenaustausch (Option)
- Netzgerät (24 V, 20 W) für das Eyesys Gauge (Option)
- Stromversorgungskarte mit integriertem DSP zur Verwaltung der Ausgangsspannung.
- Hochspannungskarte(n)

BEZEICHNUNG	BESTELL-NUMMER
Dual Modelle	
Grundmodell 120 VWs mit 1 HV-Karte m. negativer Polung	929-7000
Grundmodell 120 VWs mit 2 HV-Karten m. negativer Polung	929-7001
Grundmodell 120 VWs mit 1 HV-Karte m. positiver Polung	929-7002
Grundmodell 120 VWs mit 2 HV-Karten m. positiver Polung	929-7003
Grundmodell 230 VWs mit 1 HV-Karte m. negativer Polung	929-7004
Grundmodell 230 VWs mit 2 HV-Karten m. negativer Polung	929-7005
Grundmodell 230 VWs mit 1 HV-Karte m. positiver Polung	929-7006
Grundmodell 230 VWs mit 2 positiven HV-Karten	929-7007
Grundmodell 120 VWs mit 1 HV-Karte m. negativer Polung und RS 232 Karte	929-7008
Grundmodell 120 VWs mit 2 HV-Karten m. negativer Polung und einer RS 232 Karte	929-7009
Grundmodell 120 VWs mit 1 HV-Karte m. positiver Polung und RS 232 Karte	929-7010
Grundmodell 120 VWs mit 2 HV-Karten m. positiver Polung und einer RS 232 Karte	929-7011
Grundmodell 230 VWs mit 1 HV-Karte m. negativer Polung und RS 232 Karte	929-7012
Grundmodell 230 VWs mit 2 HV-Karten m. negativer Polung und einer RS 232 Karte	929-7013
Grundmodell 230 VWs mit 1 HV-Karte m. positiver Polung und RS 232 Karte	929-7014
Grundmodell 230 VWs mit 2 HV-Karten m. positiver Polung und einer RS 232 Karte	929-7015

Der Dual-Controller kann bis zu 2 Ionenpumpen von 20l/s bis 500 l/s mit positiver oder negativer Polung steuern. Er gewährleistet eine zuverlässige Ablesung von Druckwerten bis zu 10^{-11} Torr und verbessert die Leistung der Pumpe innerhalb des ganzen Arbeitsbereichs.
Mit zwei optionalen Eyeses Normalen können Druckmessungen unterschiedlicher Genauigkeiten in verschiedenen Bereichen vorgenommen werden.
Der Dual-Controller kann in Modus LOKAL, FERN-E/A und SERIAL über die Schnittstellen RS 232-422 und 485 gesteuert werden (die RS232 und RS485 Karte sind Optionen).

ANMERKUNG

Zum Bestellen von Systemen mit RS 422/485 und Eyesys Gauge ein Verkaufsbüro von Varian kontaktieren.

Wie dem System Steuerbefehle übergeben werden, hängt von der Betriebsart des Controllers ab:

- Im LOKAL-Modus werden alle Befehle über die vordere Schalttafel eingegeben.
- Im Modus Fern-E/A kommen alle Befehle über Fern-E/A-Signale (Relaiskontakte), die an den Stecker für Fernsteuerung auf der Rückseite angeschlossen sind.
- Im SERIAL-Modus kommen die Befehle über einen lokalen Computer, der an die RS 232-422-485 Schnittstelle angeschlossen ist.

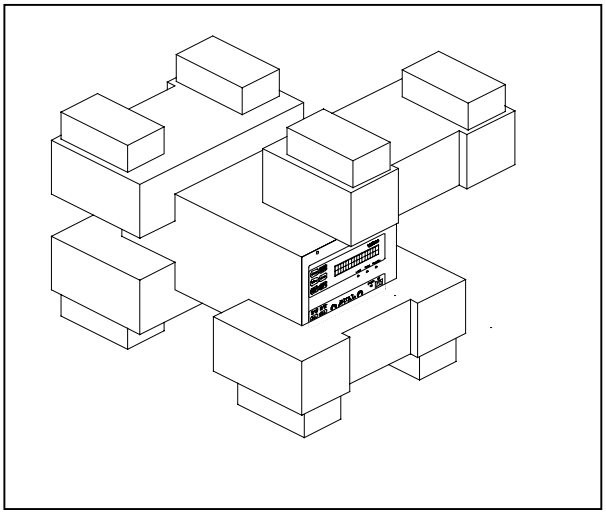
LAGERUNG

Bei Transport und Lagerung der Controller müssen folgende Umgebungsbedingungen eingehalten werden:

- Temperatur: -20 °C bis +70 °C
- Rel. Luftfeuchtigkeit: 0-95 %
  (nicht kondensierend))

VOR DER INSTALLATION

Der Controller wird mit einer speziellen Schutzverpackung geliefert. Eventuelle Transportschäden müssen sofort der zuständigen örtlichen Verkaufsstelle gemeldet werden.
Das Verpackungsmaterial muß korrekt entsorgt werden. Es ist vollständig recyclebar und entspricht der EG-Richtlinie 85/399 für Umweltschutz.



Verpackung des Controllers

Die Dual-Controller sind fabrikseitig für folgende Versorgungsspannungen ausgelegt:

- Modelle 929-7000/1/2/3 und 929-7008/09/10/11, Eingangsspannung 100 - 120 VWs, Frequenz 50/60 Hz
- Modelle 929-7004/5/6/7 und 929-7012/13/14/15; Eingangsspannung 200 - 240 VWs, Frequenz 50/60 Hz

INSTALLATION

GEFAHR!

Der Dual-Controller wird mit einem Netzkabel mit 3 Leitern und mit einem den internationalen Normen entsprechenden Netzstecker geliefert. Es sollte immer dieses Netzkabel benutzt werden, das an eine vorschriftsmäßig geerdete Steckdose anzuschließen ist, um Stromentladungen zu vermeiden.
Im Inneren des Controllers entstehen hohe Spannungen, die schwere Schäden verursachen und lebensgefährlich sein können. Vor jedem Montage- bzw. Wartungseingriff muß deshalb der Netzstecker gezogen werden.

ACHTUNG!

Der Controller kann auf einen Tisch oder ein Gestell montiert werden. In beiden Fällen muß eine ungehinderte Zirkulation der Kühlluft durch die im Gehäuse vorne und unten eingelassen Luftöffnungen gewährleistet sein.
Wenn der Controller in einem Gestell montiert wird, MUSS er in einer vier Rackeinheiten hohen Adapter-Einheit installiert werden, um zu vermeiden, daß der Controller nicht in das Gestell fällt. Die vordere Schalttafel des Dual-Controllers ist nicht geeignet, das gesamte Gewicht der Einheit zu tragen.
Der Controller darf nicht in Umgebungen installiert u/o benutzt werden, die Witterungseinflüssen (Regen, Frost, Schnee), Staub und aggressiven Gasen ausgesetzt sind und in denen Explosions- und erhöhte Brandgefahr besteht.

ANMERKUNG

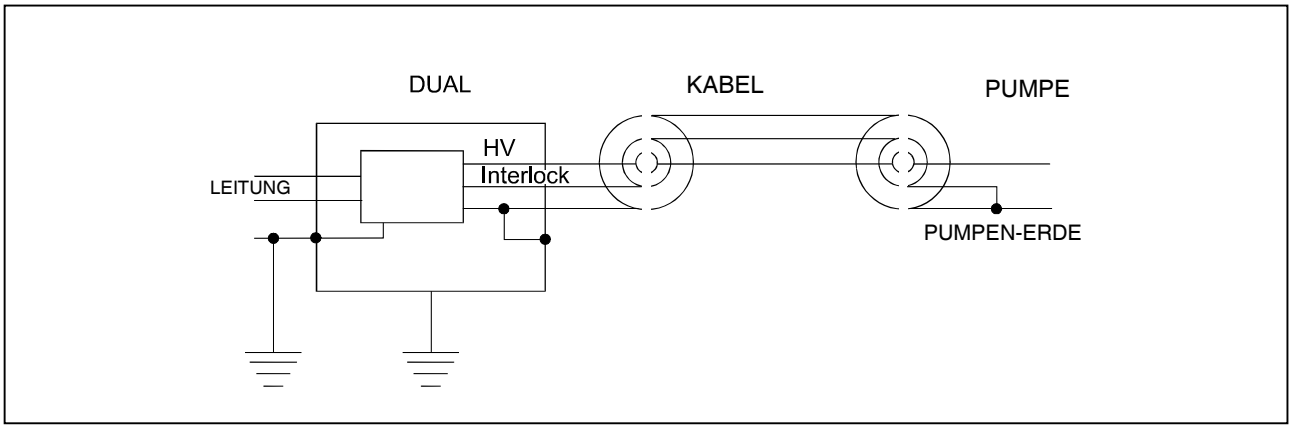
Wenn der Controller in einem Gestell installiert werden soll, müssen alle vier Füße abmontiert und über- und unterhalb wenigstens 30 mm (1,2 Zoll) Platz gelassen werden.

Während des Betriebs müssen folgende Umgebungsbedingungen eingehalten werden:

- Temperatur: 0 °C to +45 °C
- Rel. Luftfeuchtigkeit: 0 - 95 %
  (nicht kondensierend)

Für den Anschluß des Controllers an die Pumpe muß das optional gelieferte Kabel benutzt werden.

Detailliertere Hinweise zu weiteren Anschlußarten sowie zum Einsatz von Zusatzkarten finden Sie im Anhang "Technical Information".



Erdung

ANMERKUNG

Die Verriegelung des Kabels wird auf der Masse der Pumpe geschlossen. Wenn die Verbindung unterbrochen wird, wird die Hochspannung deaktiviert. Die Verriegelung mit dem entsprechenden Gegenstecker schließen, wenn ein Kabel ohne Verriegelungsstecker benutzt wird.

GEBRAUCH

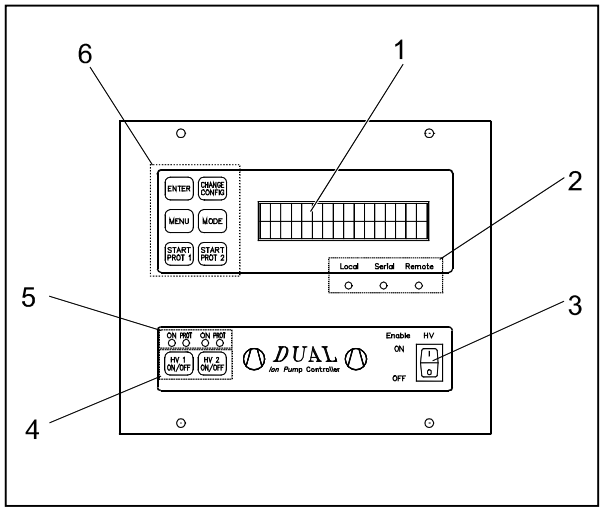
In diesem Kapitel sind die wichtigsten Betriebsvorgänge aufgeführt. Für weitere Hinweise bezüglich Anschluß und Montage des bestellbaren Zubehörs verweisen wir auf das Kapitel "USAGE" im Anhang zu "Technical Information". Vor Benutzung des Controllers müssen sämtliche elektrischen und pneumatischen Anschlüsse ausgeführt und die Betriebsanleitung der angeschlossenen Pumpe durchlesen werden.

GEFAHR!

Steht die Pumpe auf einem Tisch, muss auf stabilen Stand geachtet werden, da sonst die Gefahr von Verletzungen und Geräteschäden besteht. Die Pumpe nie einschalten, wenn der Eingangsflansch nicht am System angeschlossen bzw. nicht mit dem Schließflansch abgedeckt ist.

Schalter und Anzeigen auf der vorderen Schalttafel

Die folgende Abbildung zeigt die vordere Schalttafel des Dual-Controllers und die Tabelle erläutert die Bedeutung und Funktion der Schalter und Anzeigen.



Vordere Schalttafel

Legende:

1. von hinten beleuchtetes Flüssigkristall-Display (16 Zeichen x 2 Zeilen)

2. grüne LEDs zur anzeige der gewählten Betriebsart:

   - LED LOKAL an, wenn der lokale Modus gewählt ist
   - LED SERIELL an, wenn der Modus SERIELL gewählt ist
   - LED REMOTE an, wenn der Modus Fern-E/A gewählt ist

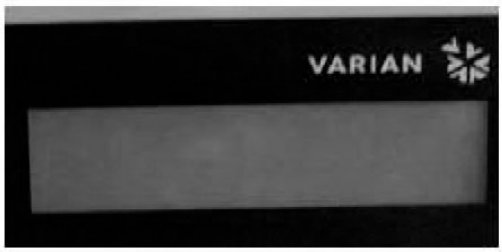
3. Schalter HV ENABLE ist unabhängig von der gewählten Betriebsart aktiv. Um die HV von der vorderen Schalltafel, den Fern-E/As oder über die serielle Verbindung aus einzuschalten, muss dieser Schalter auf EIN stehen.

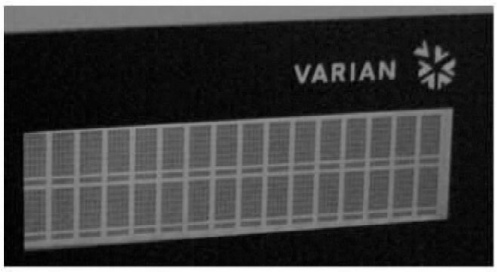
4. Tasten HV1 ein/aus und HV2 ein/aus benutzt zum Ein-/Ausschalten der Operation der Hochspannungskreise.
5. LEDs; wenn die LED EIN an ist, ist der betreffende Hochspannungskreis aktiviert. Ist die LED PROT an, wurde für die betreffende Pumpe der Schutzmodus gewählt.
6. Gruppe von 6 Funktionstasten mit folgenden Funktionen:
   - ENTER Taste zum Bestätigen der mit der CHANGE Taste vorgenommenen Wahl
   - CHANGE CONFIG Taste zur Anzeige aller verfügbaren Optionen
   - MENU Taste zum Zugriff auf das Konfigurationsmenü
   - MODE Taste zur Wahl der Betriebsart
   - Tasten START PROT 1 und START PROT 2 zur Wahl des Anlaufschutz-Modus für die betreffende Pumpe

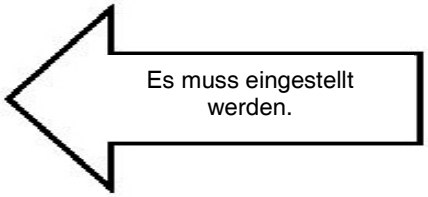
Kontrasteinstellung auf dem LCD-Bildschirm des Controllers mit Ionenpumpe "DUAL"

Der Controller mit Ionenpumpe "DUAL" ist mit einem LCD-Bildschirm ausgestattet, der sich auf der vorderen Schalttafel der Steuereinheit befindet. Bei Eintreten einer der folgenden Bedingungen muss der Displaykontrast neu geregelt werden, auch wenn er werkseitig voreingestellt ist:

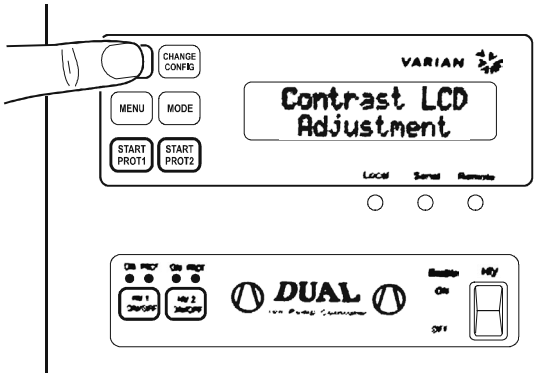
- Die Beleuchtung von hinten ist in Betrieb genommen, aber auf dem Display erscheint kein Buchstabe.
- Die Beleuchtung von hinten ist in Betrieb genommen, aber auf dem Display erscheint eine Matrize mit schwarzen Kästchen.







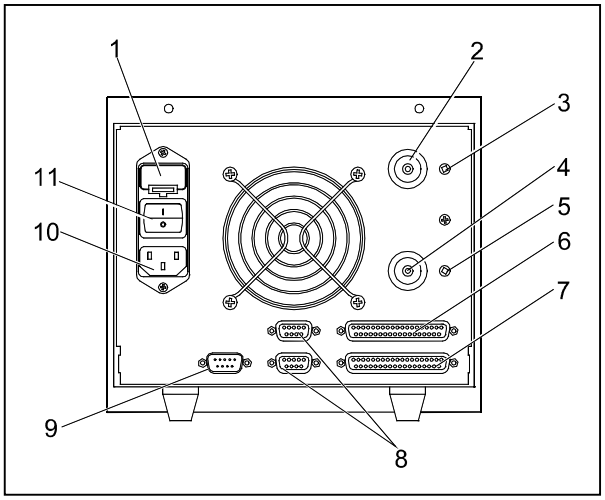
Zur Displaykontrasteinstellung auf den Controller zugreifen und nach dem Bootstrap die ENTER-Taste betätigen, die sich auf der vorderen Schalttafel befindet und diese solange gedrückt halten bis die gewünschte Einstellung erreicht wurde. Dann die Taste "ENTER" loslassen, der Kontrastwert wird dann im Speicher der Einheit abgespeichert werden.



Wenn die Einheit auf die "Modalität yur Kontrasteinstellung" zugreift, erscheint auf dem Display eine Nachricht und die LEDs auf dem Display beginnen zu blinken.

Hintere Schalttafel des Dual-Controllers

Die folgende Abbildung zeigt die Schalter und Anschlußstellen der hinteren Schalttafel des Dual-Controllers. Die gezeigt Konfiguration besteht aus zwei HV-Karten, zwei Karten 'Set Point/Remote Control', einer Karte 'RS 232/422 Computer Interface' und Anschluss zu zwei Eyesys Gauges.



Hintere Schalttafel

1. Sicherungsfach
2. HV2 Fischer-Stecker
3. Verriegelung für das HV-Kabel am HV2-Stecker
4. HV1 Fischer-Stecker
5. Verriegelung für das HV-Kabel am HV1-Stecker
6. 37-poliger Stecker für Fern-E/A HV2
7. 37-poliger Stecker für Fern-E/A HV1
8. 9-polige Stecker für Multi Gauge Eyesys
9. 9-poliger Stecker der seriellen Schnittstelle
10. Stecker für Netzkabel
11. Hauptschalter

BEDIENUNG

Betriebsarten

Der Dual-Controller kann in den folgenden Modi arbeiten:

- LOKAL
- FERN-E/A (Ein-/Ausgang)
- SERIELL.

Bei LOKAL werden alle Befehle über die vordere Schaltafel gegeben.

Bei FERN-E/A kommen alle Befehle von einem abgesetzten Computer über den E/A-Stecker auf der hinteren Schalttafel.

Bei SERIELL kommen alle Befehle von einem externen Computer, der über eine serielle Schnittstelle RS 232-422-485 angeschlossen ist.

ANMERKUNG

Das System speichert, welche Betriebsart gewählt ist, und setzt daher bei Wiederanlauf nach einem Stromausfall mit der Betriebsart fort, die vor der Unterbrechung gewählt war.

ANMERKUNG

Wenn eine Betriebsart gewählt ist, nimmt das System nur die in diesem Modus gültigen Befehle an. Es kann aber gleichzeitig Informationen anzeigen und Signale und Daten von allen Schnittstellen entgegennehmen.

Der Controller kann in folgenden Betriebsarten betrieben werden:

- **START-Modus**
- **PROTECTED-Modus**

In der **Betriebsart START** arbeitet der Controller unabhängig vom Pumpenzustand bei voller Leistung bis zum voreingestellten Kurzschlußstromwert. Diese Betriebsart muß zur Steuerung von Pumpen bei Hochdruck gewählt werden.

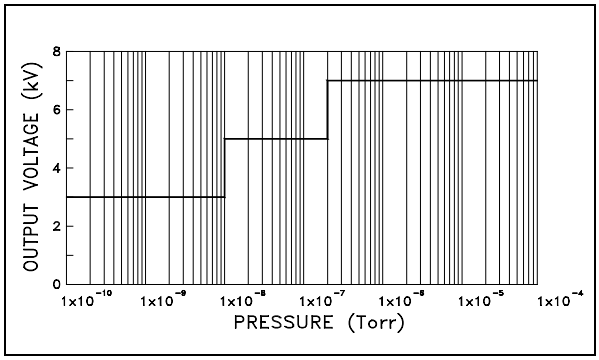
In der **Betriebsart PROTECTED** werden der Stromausgangswert des Controllers begrenzt und die Hochspannung abgeschaltet, sobald der Strom den voreingestellten Schwellenwert länger als 0,2 Sekunden überschreitet.

Bei Normalbetrieb ist dies der bevorzugte Modus, da bei Versagen von Ionenpumpe oder Kabel wegen Kurzschluss oder Überlastung der Starkstrom abschaltet.

Detaillierte Angaben zu den beiden Betriebsarten finden sich im Anhang “Technical Information".

Stufenbetrieb

Stufenbetrieb muss gewählt werden, um die Pumpenleistung zu erhöhen und bei sehr niedrigem Druck ohne Einfluss des Leckstroms ablesen zu können. Im Stufenbetrieb wählt der Dual-Controller die beste Ausgangsspannung entsprechend dem Pumpen-eingangsdruck (siehe die folgende Abbildung).



Änderung der Ausgangsspannung in Funktion des Drucks

Einschalten des Controllers von der vorderen Schalttafel (LOKAL-Modus)

ANMERKUNG

Um die Hochspannung einschalten zu können, muss die externe Verriegelung geschlossen sein (Stecker eingesteckt).
Wenn kein Anschluss nach außen gemacht werden soll, die mit der Einheit gelieferten Brücke zum Schließen einsetzen.

Zum Einschalten des Controllers und zur Aktivierung von Spannung an den Hochspannungssteckern wie folgt vorgehen:

- Das Kabel von der Pumpe und den Rückkoppelungsstift der Verriegelung am Hochspannungskabel in die betreffenden Stecker auf der hinteren Schalttafel einsetzen.
- Den Netzschalter auf der hinteren Schalttafel auf EIN stellen.
- Den Schalter ENABLE HV auf der vorderen Schalttafel auf EIN stellen.
- Die Tasten HV 1/2 ON/OFF drücken (die ON LED geht an).

ANMERKUNG

Wenn nur ein Hochspannungskreis installiert ist, gelten beide Zeilen auf dem Display für die Pumpe Nr. 1. Sind zwei Kreise installiert, bezieht sich jede auf eine der beiden Pumpen.

Starten der Pumpe

Zum Starten der Pumpe auf die entsprechende Taste HV ON/OFF drücken; die ON LED geht an.

Stoppen der Pumpe

Zum Stoppen der Pumpe auf die entsprechende Taste HV ON/OFF drücken; die ON LED geht aus.

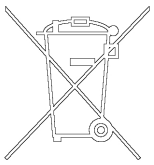
WARTUNG

Die Dual-Controller sind wartungsfrei. Eventuell erforderliche Eingriffe müssen von dazu befugtem Fachpersonal ausgeführt werden. Bei Störungen kann der Varian-Reparaturdienst in Anspruch genommen werden oder schließen Sie einen Vertrag für “Varian Advanced Exchange Service” ab, mit dem ein defekter Controller gegen einen general-überholten ausgetauscht wird.

Eine eventuelle Verschrottung muß unter Einhaltung der einschlägigen landesüblichen Vorschriften erfolgen.

ENTSORGUNG

Bedeutung des "WEEE" Logos auf den Etiketten.
Das folgende Symbol ist in Übereinstimmung mit der EU-Richtlinie WEEE (Waste Electrical and Electronic Equipment) angebracht.
Dieses Symbol (**nur in den EU-Ländern gültig**) zeigt an, dass das betreffende Produkt nicht zusammen mit Haushaltsmüll entsorgt werden darf sondern einem speziellen Sammelsystem zugeführt werden muss.
Der Endabnehmer sollte daher den Lieferanten des Geräts - d.h. die Muttergesellschaft oder den Wiederverkäufer - kontaktieren, um den Entsorgungsprozess zu starten, nachdem er die Verkaufsbedingungen geprüft hat.



FEHLERMELDUNGEN

In einigen Störungsfällen zeigt das Selbstdiagnosesystem des Controllers die in der nachstehenden Tabelle zusammengefaßten Meldungen an.

MELDUNG	BESCHREIBUNG	STÖRUNGSBEHEBUNG
FEHLER HOCHSPANNUNG 1 ODER 2		
HV(X) ERROR PANEL INTERLOCK	Hochspannung durch eine Verriegelung von der vorderen Schaltfläche oder Gehäuse ausgeschaltet. (“HV ENABLE” auf AUS gesetzt oder Gehäuse entfernt)	1. Den Schalter “HV ENABLE” auf EIN setzen und die Prozedur zum Einschalten der Hochspannung wiederholen. 2. Sicherstellen, dass das Gehäuse richtig montiert ist.
HV(X) ERROR REMOTE INTERLOCK	Hochspannung von einer Verriegelung von den Fern-E/As abgeschaltet.	1. Sicherstellen, dass die Rückkoppelungs-Stöpsel mit den Verriegelungsbrücken installiert sind. 2. Sicherstellen, dass die externe Verriegelung geschlossen ist.
HV(X) ERROR CABLE INTERLOCK	HV von einer Verriegelung eines Hochspannungskabel abgeschaltet.	1. Wenn die Pumpe ein Hochspannungskabel mit einer Sicherheitsverriegelung benutzt, sicherstellen, dass der Stecker auf der Pumpenseite richtig eingesetzt ist und der Rückkoppelungsstift auf der Seite des Controllers in die entsprechende Buchse auf der hinteren Schalttafel eingesteckt ist. 2. Wenn die Pumpe ein einpoliges Hochspannungskabel ohne Verriegelung benutzt, sicherstellen, dass die Brücke richtig zwischen der HV-Steckdose des Verriegelungskabels und Erde eingesetzt ist.
HV(X) ERROR HV NOT FOUND	Der Hochspannungskreis kann nicht gefunden werden.	Die Einschaltprozedur für Dual-Controller-Hochspannung wiederholen. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.
HV(X) ERROR HV FAULT	Hochspannung wegen Fehler im Hochspannungskreis abgeschaltet.	Varian zwecks Reparatur oder Austausch kontaktieren.
HV(X) ERROR HV OVERTEMP.	Die Wärmesensoren im Dual-Controller messen eine Temperatur, die über der Sicherheitsschwelle liegt.	1. Sicherstellen, dass die Umgebungstemperatur nicht über der für den Dual-Controller zulässigen Höchsttemperatur von 45 ºC liegt. 2. Sicherstellen, dass die Ventilationsschlitze im Gehäuse nicht behindert sind. 3. Sicherstellen, dass die Ventilatorflügel sich frei drehen können und die im Dual-Controller umgeleitete Luft nicht durch Staub oder Fremdkörper blockiert ist. Warten Sie einige Minuten, bis die Temperatur im Gerät gesunken ist, und wiederholen die Prozedur zum Einschalten der Hochspannung.
HV(X) ERROR REMOTE I/O NOT FOUND	Die Karte für Fern-E/As kann nicht gefunden werden.	Die Einschaltprozedur für Dual-Controller-Hochspannung wiederholen. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.

MELDUNG	BESCHREIBUNG	STÖRUNGSBEHEBUNG
HV(X) ERROR R. I/O FAULT	Fehler im Kreis für Fern-E/As	1. Sicherstellen, dass die externen Anschlüsse der Fern-E/As so verbunden sind wie in diesem Handbuch angegeben. 2. Die Einschaltprozedur für Dual-Controller-Hochspannung wiederholen. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.
HV(X) ERROR PROTECT	Bei gewählter Betriebsart “PROTECT” trat ein Überstrom auf.	Wenn nötig den START-Modus wählen, so dass der Controller arbeiten kann, bis der Kurzschluss-Strom erreicht wird
HV(X) ERROR SHORT CIRCUIT	Im Hochspannungsausgang wurde ein Kurzschluss entdeckt.	1. Die Unversehrtheit der Hochspannungskabel prüfen. 2. Das Kabel von der Ionenpumpe abnehmen und prüfen, ob es in der Pumpe oder im Kabel einen Kurzschluss gibt.
HV(X) ERROR OVER VOLT/CURR	Im Hochspannungsausgang wurden falsche Spannungs- und Stromwerte entdeckt. Dieser Fehler zeigt falsches Funktionieren des Hochspannungs-Steuerkreises an.	Die Einschaltprozedur für Dual-Controller-Hochspannung wiederholen. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.
HV(X) ERROR ZERO MEAS	Der Mikroprozessor des Dual-Controllers hat festgestellt, das an dem Hochspannungsausgang, der aktiv sein sollte, sowohl Spannung als auch Strom fehlen.	Die Einschaltprozedur für Dual-Controller-Hochspannung wiederholen. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.
FEHLER GAUGE 1 ODER GAUGE 2		
GAUGE(X) ERROR PANEL INTERLOCK	Der Schalter “HV ENABLE” steht auf AUS oder das Gehäuse wurde von der Einheit entfernt.	1. Den Schalter “HV ENABLE” auf EIN setzen und die Prozedur zum Einschalten der Hochspannung wiederholen. 2. Sicherstellen, dass das Gehäuse richtig montiert ist.
GAUGE(X) ERROR GAUGE NOT FOUND	Der Mikroprozessor kann die HW zur Gauge Steuerung nicht finden.	Das Netzteil des Dual-Controller aus- und wieder einschalten. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.
GAUGE(X) ERROR GAUGE FAULT	Im angeschlossenen Eyesys Gauge wurde eine Störung entdeckt.	1. Das Verbindungskabel zwischen Dual-Controller und Gauge prüfen. 2. Sicherstellen, dass das Eichnormal richtig arbeitet, wenn es vom Dual Controller getrennt ist. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.
GAUGE(X) ERROR GAUGE NOT CONNECT	Das Eichnormal wurde vom Dual Controller getrennt.	Das Eichnormal wieder anschließen und die Einschaltprozedur wiederholen.
SYSTEMFEHLER		
SYSTEM ERROR ER 1 ÷ 10	Nur für Diagnosen durch den Varian Service. Den Hauptschalter des Dual-Controllers aus – und wieder einschalten. Bleibt der Fehler bestehen, Varian zwecks Reparatur oder Austausch kontaktieren.	

INDICATIONS GENERALES

Cet appareillage a été conçu en vue d'une utilisation professionnelle. Il est conseillé à l'utilisateur de lire attentivement cette notice d'instructions ainsi que toute autre indication supplémentaire fournie par Varian, avant l'utilisation de l'appareillage. Varian décline par conséquent toute responsabilité en cas d'inobservation totale ou partielle des instructions données, d'utilisation incorrecte de la part d'un personnel non formé, d'opérations non autorisées ou d'un emploi contraire aux réglementations nationales spécifiques.
Les paragraphes suivants donnent toutes les indications nécessaires à garantir la sécurité de l'opérateur pendant l'utilisation de l'appareillage. Des renseignements plus détaillés se trouvent dans l'appendice "Technical Information".

Cette notice utilise les signes conventionnels suivants:

DANGER!

Les messages de danger attirent l'attention de l'opérateur sur une procédure ou une manoeuvre spéciale qui, si elle n'est pas effectuée correctement, risque de provoquer de graves lésions.

ATTENTION

Les messages d'attention apparaissent avant certaines procédures qui, si elles ne sont pas observées, pourraient endommager sérieusement l'appareillage.

NOTE

Les notes contiennent des renseignements importants, isolés du texte.

DESCRIPTION DU CONTROLEUR

Le contrôleur Dual de la Variant est un controleur pour les pompes ioniques modulaires et flexibles. L'unité est fabriquée en usine selon les exigences du client.

Le contrôleur Dual de la Variant est disponible avec:

- Un panneau frontal avec clavier, display (16x2) et carte processeur.
- Carte de I/O éloignée.
- Carte de communication sérielle (partielle).
- Alimentateur à 24 Vcc, 20 W, pour le mesureur Eyesys Gauge (optionnel).
- Carte d'alimentation avec DSP intégré pour la gestion des tensions en sortie.
- Carte de haute tension.

Les configurations sont indiquées dans le tableau suivant:

DESCRIPTION	NUMERO DE PIECE
Modèles Dual	
Unité de base à 120 Vac avec 1 carte haute tension (haut voltage) HV négative	929-7000
Unité de base à 120 Vac avec 2 cartes haute tension HV négative	929-7001
Unité de base à 120 Vac avec 1 carte haute tension HV positive	929-7002
Unité de base à 120 Vac avec 2 carte haute tension HV positive	929-7003
Unité de base à 230 Vac avec 1 carte haute tension Hv négative	929-7004
Unité de base à 230 Vac avec 2 cartes haute tension HV négative	929-7005
Unité de base à 230 Vac avec 1 carte haute tension HV positive	929-7006
Unité de base à 230 Vac avec 2 cartes haute tension HV positive	929-7007
Unité de base à 120 Vac avec 1 carte haute tension HV négative et carte RS 232	929-7008
Unité de base à 120 Vac avec 2 cartes haute tension HV négative et 1 carte RS 232	929-7009
Unité de base à 120 Vac avec 1 carte haute tension HV positive et carte RS 232	929-7010
Unité de base à 120 Vac avec 2 cartes haute tension HV positive et 1 carte RS 232	929-7011
Unité de base à 230 Vac avec 1 carte haute tension HV négative et 1 carte RS 232	929-7012
Unité de base à 230 Vac avec 2 cartes haute tension HV négative et 1 carte RS 232	929-7013
Unité de base à 230 Vac avec 1 carte haute tension HV positive et 1 carte RS 232	929-7014
Unité de base à 230 Vac avec 2 cartes haute tension positive et 1 carte RS 232	929-7015

Le contrôleur Dual est en mesure de gérer jusqu'à 2 pompes ioniques de 20 l/s à 500 l/s avec polarité positive ou négative. Il permet d'effectuer des lectures fiables de pression jusqu'à 10^{11} Torr en améliorant ainsi les prestations de la pompe en ce qui concerne le champ entier opérationnel.

Avec 2 mesureurs Eyesys Gauges optionnels l'on peut effectuer la lecture de pression avec les différentes précisions et les différents champs de mesure.

Le contrôleur Dual peut être géré en mode LOCAL, ELOIGNE I/O ET SERIEL par l'intermédiaire des interfaces RS 232-422 et 485 (les interfaces RS422 et RS485 sont optionnelles).

NOTE

Contacter le bureau de ventes Varian pour commander les systèmes avec RS 422/485 et les mesureurs Eyesys Gauge.

Les modalités selon lesquelles les commandes opérationnelles sont fournies dépendent de la modalité opérationnelle où se trouve le contrôleur:

- Dans le mode LOCAL toutes les commandes sont fournies par l'intermédiaire du panneua frontal.
- Dans le mode ELOIGNE I/O toutes les commandes sont fournies par l'intermédiaire de signaux I/O (relay contacts) directement sur le connecteur Remote Control placé sur le panneau postérieur.
- Dans le mode SERIEL toutes les commandes sont fournies par l'intermédiaire d'un ordinateur locale relié à l'interface RS 232-422-485.

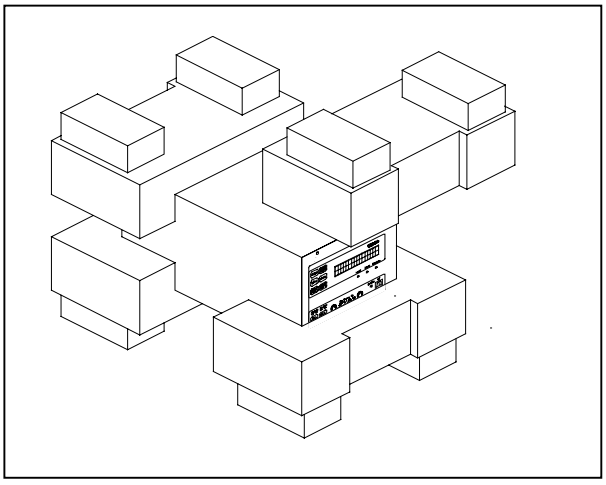
EMMAGASINAGE

Pour transporter et emmagasiner le contrôleur il faut observer les conditions suivantes d'environnement:

- température: de -20°C à +70°C
- humidité relative: 0 - 95 % (non condensante).

PREPARATION POUR L'INSTALLATION

Le contrôleur est fourni dans un emballage de protection spécial; si l'on constate des dommages pouvant s'être produits pendant le transport, contacter tout de suite le bureau de vente local. Pendant l'opération d'ouverture de l'emballage, veiller tout particulièrement à ne pas laisser tomber le contrôleur et à ne lui faire subir aucun choc. Le matériel est entièrement recyclable et il est conforme aux directives CEE 85/399 en matière de protection de l'environnement.



Emballage du contrôleur

Le contrôleur Dual est fabriqué en usine afin de pouvoir fonctionner selon les voltage suivants d'alimentation:

- Modèles 929-7000/1/2/3 et 929-7008/09/10/11, tension d'entrée de 100 à 120 Vca, fréquence de 50/60 Hz.
- Modèles 929-7004/5/6/7 et 929-7012/13/14/15; tension d'entrée de 200 à 240 Vca, fréquence de 50/60 Hz.

INSTALLATION

DANGER!

Le contrôleur Dual est pourvu d'un câble d'alimentation à trois fils pourvu d'une prise à norme internationale. Utiliser toujours ce câble d'alimentation en introduisant la prise dans une prise d'alimentation munie de liaison au sol afin d'éviter les décharges électrostatiques.
A l'intérieur du contrôleur se développent des hautes tensions qui peuvent provoquer des lésions graves ou carrément la mort. Avant d'effectuer n'importe quelle opération d'installation ou d'entretien du contrôleur, le débrancher de la prise électrique.

ATTENTION

Le contrôleur peut être utilisé soit comme unité de table que comme module installé dans une armoire. De toute façon, il doit être placé de manière à ce que l'air puisse circuler librement à travers les trous d'aération présents dans la couverture.
Lorsque le contrôleur est utilisé comme module armoire il DOIT être installé dans un adaptateur d'une hauteur de quatre unités armoire afin d'éviter qu'il ne tombe à l'intérieur de l'armoire même. Le panneau frontal du contrôleur n'est pas prévu pour supporter le poids de l'unité. Ne pas installer ou utiliser le contrôleur Dual dans des milieux exposés aux agents atmosphériques (pluie, neige, glace). En présence de poussière, de gaz corrosifs ou dans des milieux explosifs ou à fort risque d'inflammabilité.

NOTE

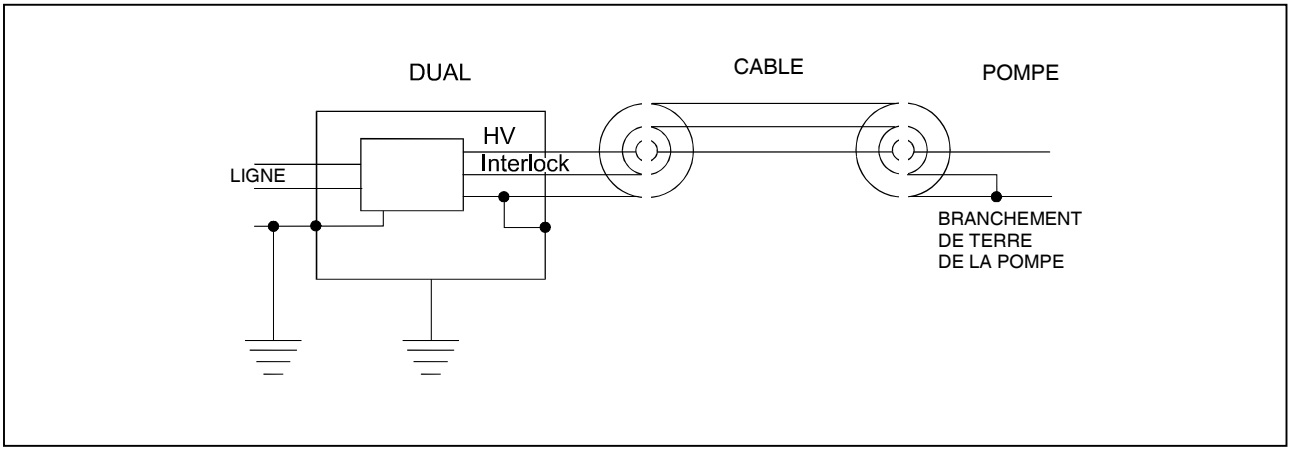
Si le contrôleur est installé dans une armoire, enlever les quatre pieds de manière à ce qu'il soit placé avec au moins 30 mm d'espace en haut et en bas.

Pendant le fonctionnement, il est nécessaire de respecter les conditions d'environnement suivantes:

- température: de 0°C à +45°C
- humidité relative: 0 - 90% (non condensante).

Pour relier le contrôleur à la pompe, utiliser le câble spécial fourni en option.

Voir l'appendice "Technical Information" pour toutes informations détaillées sur ces connexions et sur d'autres connexions ainsi que sur l'installation des cartes optionnelles.



Connexions des masses

NOTE

L'interlock du câble est serré sur la masse de la pompe. Si le branchement est coupé, la haute tension est interrompue. Lorsqu'on utilise un câble sans connecteur d'interlock, fermer l'interlock avec le connecteur de fermeture prévu à cet effet.

UTILISATION

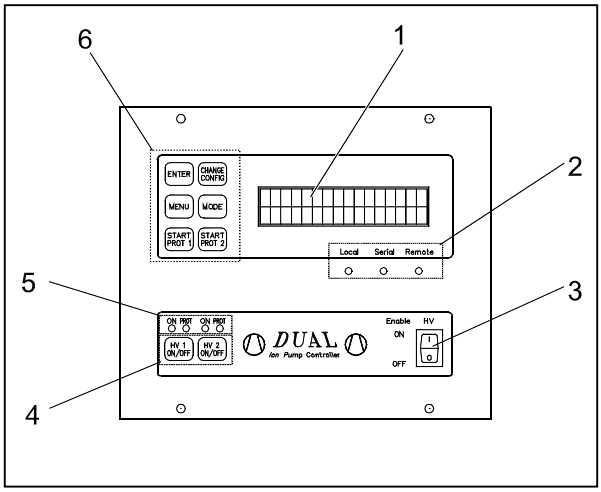
Dans ce paragraphe, on indique les principales procédures opérationnelles. Pour tous autres détails et pour les procédures concernant des connexions ou des éléments en option, se reporter au paragraphe "USE" de l'appendice "Technical Information". Avant d'utiliser le contrôleur, effectuer toutes les connexions électriques et pneumatiques et se reporter à la notice de la pompe connectée.

DANGER!

Afin d'éviter des accidents aux personnes et à l'appareillage, dans le cas où la pompe doit être placée sur une table, vérifier qu'elle soit stable. Ne jamais faire fonctionner la pompe si la bride d'entrée n'est pas reliée au système ou n'est pas fermée avec la bride de fermeture.

Contrôles ou indicateurs du panneau frontal du contrôleur Dual

Le tableau qui suit indique la définition et la fonctionnalité des contrôles et des indicateurs.



Commandes du Tableau Frontal

Legende:

1. Display à cristaux liquides verso illuminé, 16 caractères x 2 lignes
2. LED verts qui indiquent la modalité opérationnelle sélectionnée:

   - LED local allumé lorsque la modalité opérationnelle LOCAL est sélectionnée
   - LED Sériel allumé lorsque la modalité opérationnelle SERIELLE est sélectionnée
   - LET Eloigné allumé lorsque la modalité opérationnele ELOIGNE I/O est sélectionnée

3. Interrupteur HV ENABLE actif indépendamment de la modalité opérationnelle sélectionnée. Pour alimenter la haute tension du panneau de contrôle du REMOTE I/O ou de la ligne sérielle, il faut que l'interrupteur HV ENABLE soit placé dans la position ON.
4. HV1 on/off et HV2 on/off boutons, utilisés pour brancher/débrancher la fonctionnalité des circuits de haute tension

5. LEDs; lorsque le LED ON est allumé, le circuit relatif HV (haute tension/ haut voltage) est branché, lorsque le LED PROT eest allumé, la modalité opérationnelle pour la pompe correspondante a été sélectionnée.

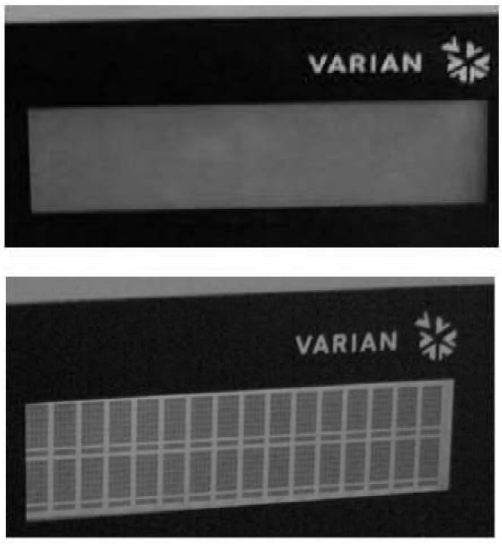
6. Groupe de six boutons de fonction avec les caractéristiques suivantes

   - bouton ENTER utilisé pour confirmer une sélection qui a été effectuée avec le bouton CHANGE
   - bouton CHANGE CONFIG utilisé pour visualiser toutes les options diponibles
   - bouton MENU utilisé pour entrer dans le menu de configuration
   - bouton MODE utilisé pour sélectionner la modalité opérationnelle
   - boutons START PROT 1 et START PROT 2 utilisés pour sélectionner la modalité Start Protect pour la pompe correspondante

Procédure de réglage du contraste de l'écran LCD du el Contrôleur à pompe ionique "DUAL"

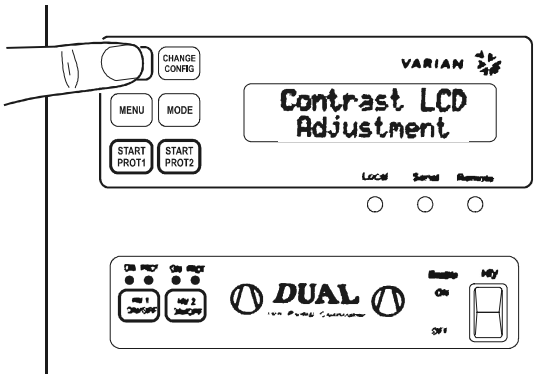
Le contrôleur à pompe ionique "DUAL" est pourvu d'un écran LCD, installé dans le panneau antérieur de l'unité. Le contraste de l'afficheur nonobstant le fait qu'il est déjà établi à l'usine, aura besoin d'être réglé si une des conditions suivantes a lieu:

- La retroillumination est active mais sur l'afficheur n'est affiché aucun caractère.
- La retroillumination est active mais sur l'afficheur est affichée une matrice à carreaux noirs.



Il est nécessaire d'effectuer la procédure de règalage

Pour effectuer la procédure de réglage du contraste de l'écran, allumer le contrôleur et, à la fin de l'initialisation appuyer sur la touche ENTER placée sur la panneau antérieur, en gardant appuyé jusqu'à l'obtention désirée. En laissant la touche "ENTER", la valeur de contraste sera sauvegardée dans la mémoire de l'unité.



Lorsque l'unité arrive à la "modalité de réglage du contraste", l'afficheur affiche le relatif message et les LED de l'afficheur commencent à clignoter.

Tableau dorsal du Dual Contrôleur

Le dessin suivant reporte les contrôles et connecteurs sur le panneau postérieur du contrôleur Dual. La configuration reportée dans le schéma consiste en deux cartes à haut voltage (HV) de deux cartes Set Point/Remote Control, une carte d'interface RS 232/422 et la liaison à deux mesureurs Eyesys Gauges.

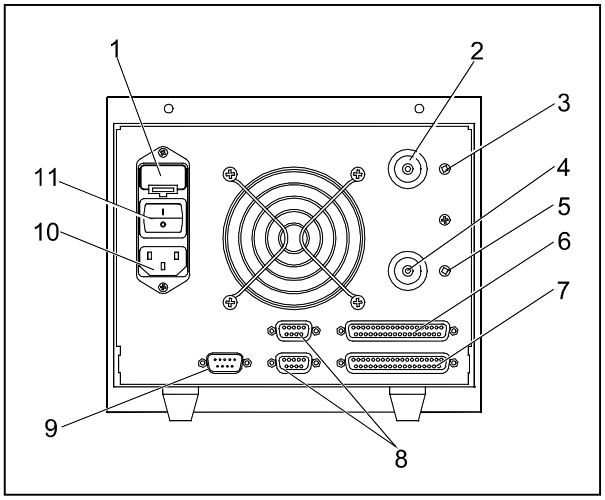


Tableau dorsal

1. Siège porte fusible
2. ConnecteurFischer HV2r
3. Interlock du câble HV sur le connecteur HV2
4. Connecteur Fischer HV1 r
5. Interlock du câble HV cable sur le connecteur HV1
6. Connecteur à37-pin pour Eloigné I/O HV2
7. Connecteur à37-pin pour Eloigné I/O HV1
8. Connecteur à 9-pin Multipour mesureurs Eyesys multiples
9. Connecteur d'interface à 9-pin
10. Prise d'alimentation
11. Interrupteur d'alimentation principal

UTILISATION

Modes de fonctionnement

Le Dual contrôleur peut fonctionner dans les modalités suivantes:

- LOCAL
- ELOIGNE I/O (input/output)
- SERIEL.

Dans le mode LOCAL toutes les commandes sont activées par le panneau frontal.

Dans le mode ELOIGNE I/O toutes les commandes sont activées par un ordinateur éloigné relié par l'intermédiaire d'un connecteur de input/output placé sur le panneau postérieur

Dans le mode SERIEL toutes les commandes sont activées par un ordinateur externe relié par l'intermédiaire d'une interface sérielle RS 232-422-485.

NOTE

La modalité opérationnelle sélectionnée est mémorisée par le système et donc dès le rétablissement de la tension suite à sa chute, le contrôleur Dual reviendra à la modalité opérationnelle où il était au moment de la chute de tension.

NOTE

Lorsque une modalité opérationnelle est sélectionnée, le systènme acceptera uniquement les commandes de la modalité relative mais il est en mesure de visualiser des informations et d'acqyérir des signaux et des données contemporairement de toutes les interfaces

L'unité est projetée afin de fonctionner dans les modalités suivantes:

- **mode START**
- **mode PROTECTED**

Dans le mode **START le contrôleur fournit toute la puissance**, indépendamment des conditions de la pompe jusqu'à atteindre le courant de court circuit. Cette modalité de fonctionnement doit être utilisée pour actionner la pompe à haute pression.

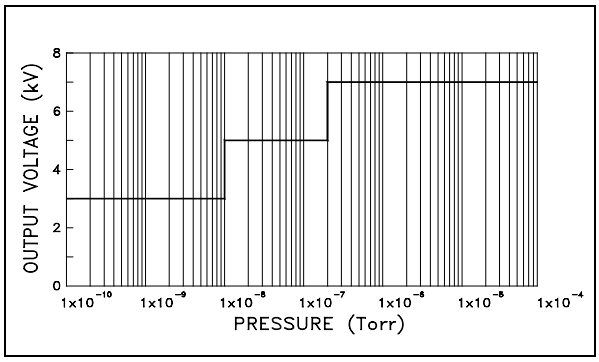
Dans le mode **PROTECTED** le contrôleur limite le courant à la sortie et éteint la haute tension lorsque la valeur du courant dépasse le seuil pendant plus de 0,2 secondes.

Dans des conditions de fonctionnement normal, on préfère utiliser cette modalité puisque, en cas de panne de pompe ionique ou câble causée par un court circuit ou une haute charge, la haute tension s'éteint.

Se référer à l'appendice "Technical Information" pour des informations détaillées sur les modalités opérationnelles.

Mode de fonctionnement Step

Le mode Step doit être choisi pour améliorer les performances de la pompe et effectuer des lectures à une pression très basse sans influer sur le courent de dispersion. Dans le mode Step le Dual contrôleur choisit la tension en sortie la plus convenable selon la pression dans la pompe (voir le dessin suivant).



Changement de la tension en sortie par opposition à la pression

Allumage du contrôleur du panneau frontal (modalité LOCAL)

NOTE

Pour allumer le haut voltage(H.V). il faut que l'interlock externe soit fermé (connecteur branché).
Au cas où aucune connexion externe n'est effectuée, brancher les pontets de fermeture interlock en dotation avec l'unité.

Procéder comme il suit pour alimenter le contrôleur et rendre apte la tension sur les connecteurs de haut voltage (HV):

- Introduire le câble provenant de la pompe et le pin d'interlock de fermeture du câble HV dans les connecteurs relatifs sur le panneau postérieur.
- Disposer l'interrupteur d'alimentation sur le panneau postérieur en positon ON.
- Disposer l'interrupteur ENABLE HV sur le panneau antérieur en position ON.
- Appuyer sur les boutons HV 1/2 ON/OFF (ON LED s'allume).

NOTE

Avec un seul circuit H.V installé les lignes du display sont dédiées à la pompe numéro un, tandis qu'avec deux circuits installés, chaque ligne est dédiée à une pompe différente.

Démarrage de la pompe

Pour faire démarrer la pompe, appuyer sur le bouton HV ON/OFF; le ON LED s'allumera.

Arrêt de la pompe

Pour arrêter la pompe appuyer sur le bouton HV ON/OFF; le ON LED s'éteindra.

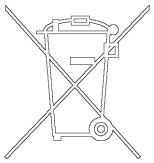
ENTRETIEN

Le contrôleur Dual n'a besoin d'aucun entretien. N'importe quel entretien sur l'unité doit être effectuè par un personnel technique autorisé. En cas de panne contacter le Support technique Varian ou bien s'abonner au Varian Advanced Exchange Service" où le contrôleur endommagé est remplacé par un contrôleur reconditionné.

En cas de mise au rebut du contrôleur, procéder à son élimination conformément aux réglementations nationales en la matière.

MISE AU REBUT

Signification du logo "WEEE" figurant sur les étiquettes.
Le symbole ci-dessous est appliqué conformément à la directive CE nommée "WEEE".
Ce symbole **(uniquement valide pour les pays de la Communauté européenne)** indique que le produit sur lequel il est appliqué NE doit PAS être mis au rebut avec les ordures ménagères ou les déchets industriels ordinaires, mais passer par un système de collecte sélective. Après avoir vérifié les termes et conditions du contrat de vente, l'utilisateur final est donc prié de contacter le fournisseur du dispositif, maison mère ou revendeur, pour mettre en œuvre le processus de collecte et mise au rebut.



MESSAGES D'ERREUR

Pour certains types de panne, le contrôleur procède à un autodiagnostic et affiche l'un des messages d'erreur indiqués dans le tableau suivant.

MESSAGE	DESCRIPTION	INTERVENTION
PANNES DE HAUTE TENSION 1 OU 2		
HV(X) ERROR PANNELL INTERLOCK	La haute tension HV a été éteinte par un interlock reçu par le panneau frontal ou par la couverture. (l'interrupteur « HV ENABLE » disposé sur OFF ou bien couverture enlevée par l'unité)	1. Placer l'interrupteurV ENABLE" sur ON et répéter la procédure d'allumage de la haute tension. 2. Vérifier que la couverture soit installée correctement.
HV(X) ERROR REMOTE INTERLOCK	La haute tension HV a été éteinte par un interlock reçu par le Remote I/O.	1. Contrôler que soient installés les interrupteurs de fermeture avec les interlock externes avec pontets. 2. Vérifier que l'interlock externe soit fermé.
HV(X) ERROR CABLE INTERLOCK	La haute tension HV a été éteinte à cause d'un interlock du câble HV	1. Si la pompe utilise un câble HV avec interlock de sécurité, contrôler que le connecteur à l'extrémité de la pompe soit introduit correctement et que le pin de fermetrure à l'extrémité de l'unité soit introduit dans le connectur dur le panneau postérieur. 2. Si la pompe utilise un câble HV à pôle simple sans interlock, vérifier que le pontet soit correctement introduit entre la prise du câble HV interlock et le sol.
HV(X) ERROR HV NOT FOUND	Le cuircuit de haute tension HV n'a pas été relevé.	Répéter la procédure d'allumage du contrôleur Dual; si le problème persiste, contacter Varian pour la réparation ou la substitution.
HV(X) ERROR HV FAULT	La haute tension a été éteinte à cause d'un dysfonctionnement dans le circuit HV.	Conctater Varian pour la réparation ou la substitution.
HV(X) ERROR HV OVERTEMP.	Les capteurs de température à l'intérieur du contrôleur Dual ont relevé une température qui dépasse les limites de sécurité.	1. Vérifer que la température environnante durant le fonctionnement du contrôleru ne soit pas supérieure à 45 º. 2. Vérifier que les trous d'aération sur la couverture ne soient pas obstrués. 3. Vérifier que les palettes du ventilateur tournent librement et que l'air apporté à l'intérieur du contrôleur Dual ne soit pas obstrué par la poussière ou par un matériau étranger. Attendre quelques minutes de manière à ce que la température interne de l'unité se refroidisse et ensuite répéter la procédure d'allumage de la haute tension HV.
HV(X) ERROR REMOTE I/O NOT FOUND	La carte Remote I/O n'a pas été relevée.	Répéter la procédure d'allumage du contrôleur Dual; si le problème subsiste, contacter Variant pour la réparation ou la substitution.

MESSAGE	DESCRIPTION	INTERVENTION
HV(X) ERROR R. I/O FAULT	Dysfonctionnement dans le circuitRemote I/O	1. Vérifier que les connecteurs externes Remote I/O soient reliés comme décrit dans ce document. 2. Répéter la procédure d'allumage du contrôleur Dual; si le problème persiste, contacter Variant pour la réparation ou la substitution.
HV(X) ERROR PROTECT	La protection de surcourant a été déclenchée lorsque la modalité opérationnelle "PROTECT" a été selectionnée.	Si nécessaire, sélectionner le mode START de manière à ce que le contrôleur puisser atteindre le courant de court circuit.
HV(X) ERROR SHORT CIRCUIT	Un court circuit à la sortie HV a été relevé.	1. Contrôler l'intégrité du câble de la haute tension. 2. Détacher le câble de la pompe ionique et vérifier s'il y a un cout circuit dans la pompe ou dans le câble.
HV(X) ERROR OVER VOLT/CURR	Des valeurs erronées de voltage et de courant sur la sortie HV ont été relevées. Cette erreur indique un dysfonctionnement du circuit de contrôle HV	Répéter la procédure d'allumage du contrôleur Dual; si le problème persiste contacter Variant pour la réparation ou la substitution.
HV(X) ERROR ZERO MEAS	Le microprocesseur du contrôleur Dual a relevé que soit la tension que le courant ne sont pas présents à la sortie HV qui devait être active.	Répéter la procédure d'allumage du contrôleur Dual; si le problème persiste, contacter Varian pour la réparation ou la substitution.
ERREURS DE FONCTIONNEMENT DES MESUREURS 1 OU 2		
GAUGE(X) ERROR PANEL INTERLOCK	L'interrupteur "HV ENABLE" est placé sur OFF ou bien la couverture a été enlevée par l'unité	1. Placer l'interrupteur "HV ENABLE" sur ON et répéter la procédure d'allumage. 2. Vérifier que la couverture soit installée correctement
GAUGE(X) ERROR GAUGE NOT FOUND	Le microprocesseur ne relève pas l'HW de gestion mesureur.	Eteindre l'alimentateur du contrôleur Dual et ensuite le réallumer. Si le problème persiste, contacter Varian pour la réparation ou la substitution.
GAUGE(X) ERROR GAUGE FAULT	Un dysfonctionnement a été relevé dans le mesureur Eyesys.	1. Vérifier le câble de liaison entre le contrôleur et le mesureur. 2. Vérifier que le mesureur fonctionne correctement losrsqu'il est débranché du contrôleur Dual.Si le problème persiste, contacter Variant pour la réparation ou la substitution.
GAUGE(X) ERROR GAUGE NOT CONNECT	Le mesureur a été débranché par le contrôleur Dual	Rebrancher le mesureur et répéter la procédure d'alimentation
SYSTEM ERRORS		
SYSTEM ERROR ER 1 ÷ 10	Aux fins du Support technique Variant pour le diagnostic.Eteindre et allumer le contrôleur Dual; si le problème persiste, contacter Varian pour la réparation ou la substitution.	

GENERAL INFORMATION

This equipment is intended for professional use. Prior to using this equipment the user must carefully read this Instruction Manual in its entirety and any additional information provided by Varian. Varian declines all responsibility for damage caused by the total or partial misuse of the instructions provided herein, by the improper use of the equipment by untrained personnel, by unauthorized interventions or by negligence in complying with any specific national rule or regulation.
The following sections provide you with all the information needed to guarantee the operator's safety when using the equipment. Detailed information is provided in the appendix entitled "Technical Information".

The following conventions are used in this manual:

DANGER!

Danger messages call the operator's attention to a specific procedure or operation that could cause serious injury if not performed correctly.

WARNING

Warning messages are provided before procedures that could cause damage to the equipment if not complied with.

NOTE

Notes provide you with important information extracted from the text.

CONTROLLER DESCRIPTION

Varian's Dual controller is a flexible ion pump controller, which is pre-configured at the factory according to the customer's requirements.

The Dual controller is available with:

- Front panel with keypad, display (16x2) and microprocessor card.
- Remote I/O card.
- Serial data exchange card (optional).
- 24 Vdc, 20 W, power supply unit for the Eyesys Gauge (optional).
- Power supply card with integrated DSP for output voltage management.
- High voltage card(s).

The configurations are listed in the following table:

DESCRIPTION	PART NUMBER
Dual Models	
120 Vac basic unit with 1 negative HV	929-7000
120 Vac basic unit with 2 negative HV's	929-7001
120 Vac basic unit with 1 positive HV	929-7002
120 Vac basic unit with 2 positive HV's	929-7003
230 Vac basic unit with 1 negative HV	929-7004
230 Vac basic unit with 2 negative HV's	929-7005
230 Vac basic unit with 1 positive HV	929-7006
230 Vac basic unit with 2 positive HV's	929-7007
120 Vac basic unit with 1 negative HV and RS 232 card	929-7008
120 Vac basic unit with 2 negative HV cards and one RS 232 card.	929-7009
120 Vac basic unit with 1 positive HV and RS 232 card	929-7010
120 Vac basic unit with 2 positive HV cards and one RS 232 card.	929-7011
230 Vac basic unit with 1 negative HV and RS 232 card	929-7012
230 Vac basic unit with 2 negative HV cards and one RS 232 card.	929-7013
230 Vac basic unit with 1 positive HV and RS 232 card	929-7014
230 Vac basic unit with 2 positive HV cards and one RS 232 card.	929-7015

The Dual controller can control up to two ion pumps, from 20 l/s to 500 l/s with positive or negative polarity. Reliable pressure are measured at up to 10^{-11} Torr. Variable voltages allow the pump performance to be optimized on the entire operational field.

With two optional Eyesys Gauges, pressure readings can be taken with different accuracy and fields of measurement.

The Dual controller can be controlled in the LOCAL mode, REMOTE I/O mode and in the SERIAL mode via the RS 232-422 and 485 ports (the RS422 and RS485 are optional).

NOTE

To order systems with RS 422/485 and Eyesys Gauges, contact the Varian sales office.

The ways in which the operating commands are entered into the system differ depending on the controller's mode of operation:

- In the LOCAL mode all the commands are entered through the front panel
- In the REMOTE I/O mode all the commands are entered through remote I/O signals (Relay contacts) which are connected to the Remote Control connector on the rear panel
- In the SERIAL mode all the commands are through a local computer connected to the RS 232-422-485 interface.

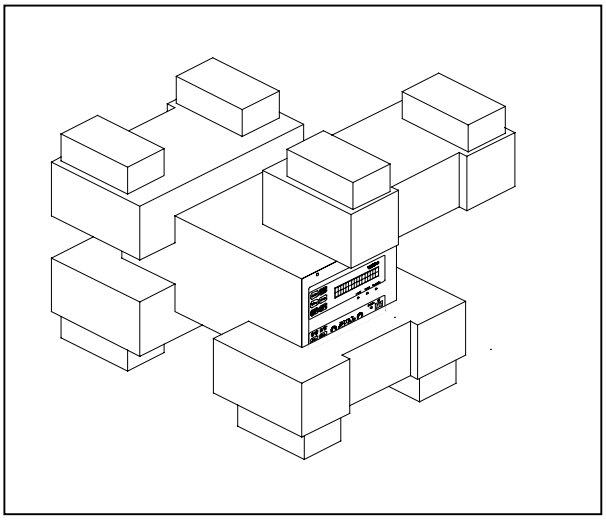
STORAGE

The following environmental conditions must be met when transporting and storing the controller:

- Temperature: -20 °C to +70 °C
- Relative humidity: 0 - 95% (non-condensing)

PRIOR TO INSTALLATION

The controller comes in a special protective packaging; if there is any sign of damage that could have been caused during transportation, contact your local sales office immediately.
When unpacking the controller, be particularly careful to avoid dropping it or knocking it against anything.
The packaging material is totally recyclable and complies with EEC directives 85/399 for the safeguard of the environment.



Controller Packaging

The Dual controller is preset at the factory to operate with the following power supply voltages:

- Models 929-7000/1/2/3 and 929-7008/09/10/11, input voltage of 100 to 120 Vac, frequency of 50/60 Hz,
- Models 929-7004/5/6/7 and 929-7012/13/14/15; input voltage of 200 to 240 Vac, frequency of 50/60 Hz,

INSTALLATION

DANGER!

The Dual controller is equipped with a three-wire power cord with an internationally approved plug. Always use this power cord and insert the plug into an appropriately grounded power outlet to avoid electrostatic discharges. High voltages that could cause serious injury or even death are generated inside the controller. Before performing controller installation or maintenance, disconnect the unit from the power outlet.

WARNING

The controller can be used either as a desktop unit or as a rack module. In any case it must be positioned in a way that the air can circulate freely through the ventilation slots on the cover.
If the controller is used as a rack module, it MUST be inserted into a four-rack high adapter to prevent it from falling inside the rack itself. The Dual controller front panel is not designed to support the weight of the unit.
Do not install or use the controller in an environment exposed to atmospheric agents (rain, snow, ice), in the presence of dust, corrosive gases or in a highly flammable or explosive environment.

NOTE

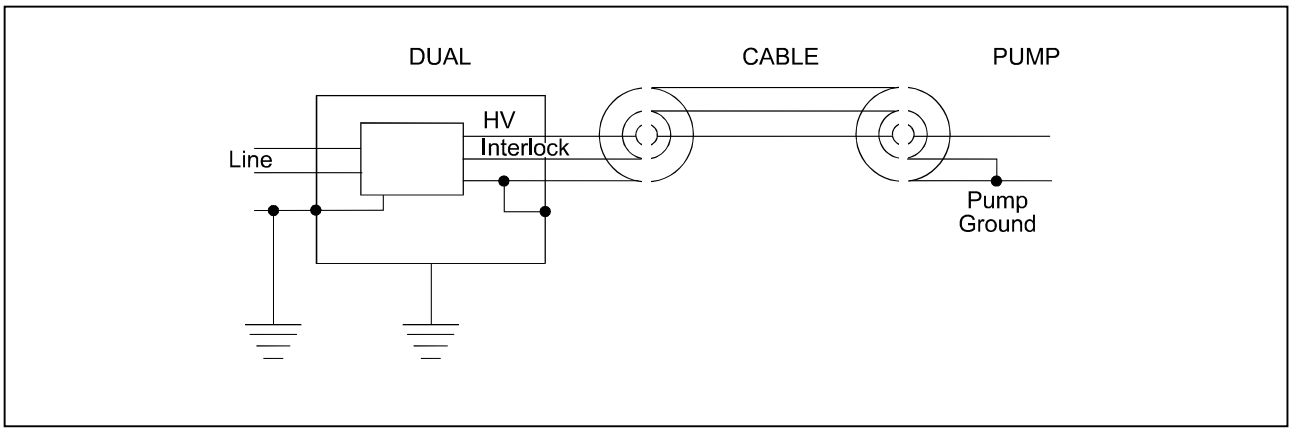
If the controller is installed in a rack, remove its four feet and place it so as to leave at least 30 mm (1.2 inches) of free space above and below.

The controller must be used in the following environmental conditions:

- Temperature: 0 °C to +45 °C
- Relative humidity: 0 - 90% (non-condensing)

To attach the controller to the pump use the specific cable supplied as option.

Refer to the appendix entitled “Technical Information” for detailed information on these and other connections.



Ground Connections

NOTE

The cable interlock closes on pump ground. The high voltage is disabled if the connection is interrupted. Close the interlock using the appropriate counter-connector when using a cable which is not equipped with the interlock connector.

USAGE

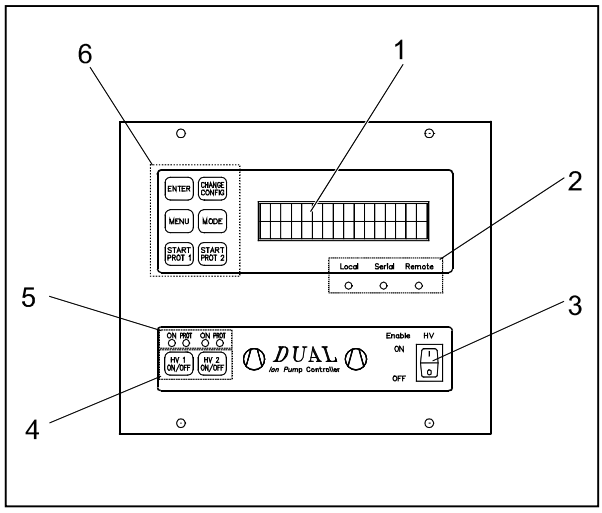
This section provides you with the major operating procedures. For more information and for the procedures that concern connections or specific options, refer to the section “USAGE” in the “Technical Information” appendix. Before using the controller, perform all electrical and pneumatic connections and refer to the manual of the connected pump.

DANGER!

To avoid injury to persons or damage to the equipment, if the pump needs to be placed on a table make sure that the table is stable. Never activate the pump if the input flange is not connected to the system or if it is not closed with the blank-off flange.

Controls and Indicators on the Dual Controller Front Panel

The following figure shows the Dual controller front panel. The following table gives the definition and function of the controls and indicators.



Front Control Panel

Legend:

1. Back-lit Liquid Crystal Display, 16 characters x 2 rows

2. Green LEDs, indicating the selected operating mode:

   - Local LED on when the LOCAL operating mode is selected
   - Serial LED on when the SERIAL operating mode is selected
   - Remote LED on when the REMOTE I/O operating mode is selected

3. HV ENABLE switch, active regardless of the operating mode selected. To power on the HV from the front control panel, from Remote I/O or from the serial line, the HV ENABLE switch must be set to the ON position.

4. HV1 on/off and HV2 on/off buttons, used to enable/disable the operation of the high voltage circuits.

5. LEDs; when the ON LED is lit the corresponding HV circuit is enabled. While when the PROT LED is lit the Protect operating mode has been selected for the corresponding pump.

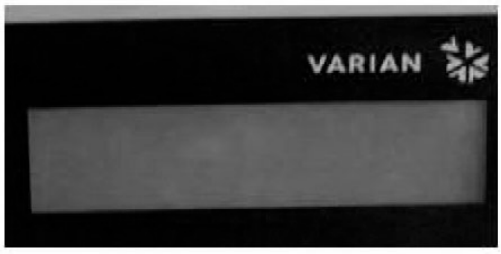
6. Group of six function buttons with the following functions:

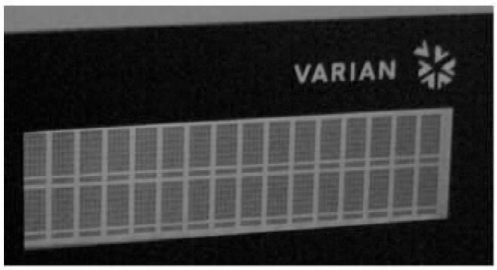
   - ENTER button, used to confirm a selection that has been made with the CHANGE button
   - CHANGE CONFIG button, used to display all of the different options available
   - MENU button, used to enter into the configuration menu
   - MODE button, used to select the operating mode
   - START PROT 1 and START PROT 2 buttons, used to select the Start Protect operating mode for the corresponding pump.

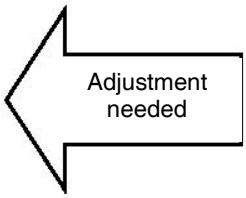
Sequence to adjust the LCD contrast of the "DUAL" Ion Pump Controller

The 'DUAL' ion pump controller is equipped with a LCD display, located on the controller front panel. The contrast of the display is factory set.
Anyway, a contrast adjustment will be needed if one of the following conditions would be true:

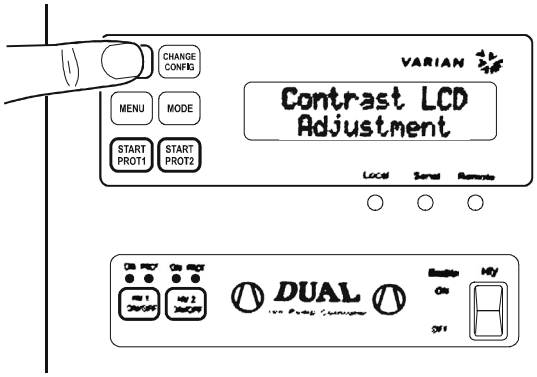
- backlights are on but no characters appear on the display
- backlights are on but a black squares matrix appear on the display







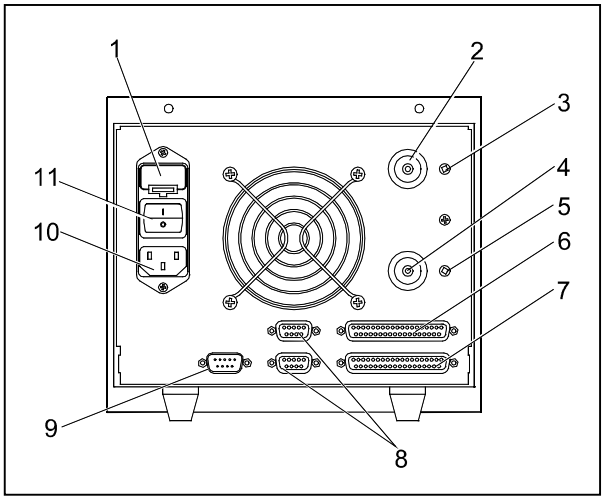
In order to perform the display contrast regulation, power on the controller and, after the startup, press the ENTER button on the front panel. Then, keep it pushed until the proper setting is obtained. Releasing the 'enter button' will cause the storage of the contrast value into the unit memory.



When the unit enters into the "contrast adjustment modality" a specific message will appear on the display and all the LED indicators placed under the diplay will start to blink together.

Rear Panel of the Dual Controller

The following figure shows the controls and connections on the rear panel of the Dual controller. The configuration shown in the following figure consists of two H.V. cards, two Set Point/Remote Control cards and one RS 232/422 Computer Interface card and the connection to two Eyesys Gauges.



Rear Panel

1. Fuse holder compartment
2. Fischer HV2 connector
3. Interlock for the HV cable on connector HV2
4. Fischer HV1 connector
5. Interlock for the HV cable on connector HV1
6. 37-pin connector for Remote I/O HV2
7. 37-pin connector for Remote I/O HV1
8. 9-pin Multi Gauge Eyesys connectors
9. 9-pin serial interface connector
10. Power cord socket
11. Main power switch

OPERATING PROCEDURES

Operating Modes

The Dual controller can work in the following operating modes:

- LOCAL
- REMOTE I/O (input/output)
- SERIAL.

In the LOCAL mode all the commands are given through the front panel.

In the REMOTE I/O mode all the commands are given from a remote computer through the input/output connector located on the rear panel.

In the SERIAL mode. All the commands are given from an external computer through the RS 232-422-485 serial line.

NOTE

The selected mode of operation is stored by the system and therefore even if a power failure occurs, when the power is restored, the Dual controller will return to the mode of operation that it was in prior to the blackout.

NOTE

When any one mode of operation is selected, the system will only accept the commands of that related mode while being able to simultaneously display information and acquire signals and data from all the interfaces.

The unit is designed to work in the following modes:

- **START mode**
- **PROTECTED mode**

In the **START mode** the controller provides all the power regardless of the pump's conditions, until reaching the short circuit current. This mode of operation must be used to start the pump at High Pressure.

In the **PROTECTED mode** the controller limits the output current and switches off the high voltage when the current exceeds the threshold current for more that 0.2 seconds.

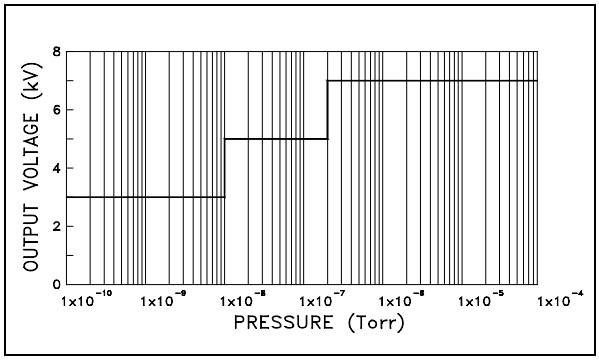
In normal operation, this is the preferred mode, as any failure of the ion pump or cable due to short circuit or high load will cause the high current to switch off.

Refer to the appendix entitled "Technical Information" for detailed information on the modes of operation.

Step Mode of Operation

The Step mode has to be chosen in order to increase the performance of the pump and to read at very low pressure without influence of leakage current.

In Step mode the Dual controller chooses the best output voltage according to the pressure into the pump (see the following figure).



Output voltage change-over vs pressure

Powering On the Controller from the Front Panel (LOCAL Mode)

NOTE

To switch on the H.V. the external interlock must be closed (connector inserted).
If no external connection is made, insert the interlock-closing jumper that are provided with the unit.

Proceed as follows to power on the controller and enable the voltage on the H.V. connectors:

- Insert the cable from the pump and the interlock loopback pin of the H.V. cable into the related connectors on the rear panel.
- Set the power switch on the rear panel to the ON position.
- Set the ENABLE HV switch on the front panel to the ON position.
- Press the HV 1/2 ON/OFF buttons (ON LED lit).

NOTE

With only one H.V. circuit installed both rows on the display are dedicated to pump number one, while with two circuits installed each row is dedicated to a different pump.

Starting the Pump

To start the pump, press the corresponding HV ON/OFF button; the ON LED will come on.

Stopping the Pump

To stop the pump press the corresponding HV ON/OFF button; the ON LED will go off.

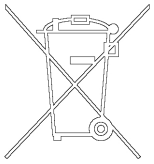
MAINTENANCE

The Dual controller does not require any maintenance. Any form of servicing on the unit must be performed by authorized personnel.
If servicing is needed, contact Varian Technical Support or subscribe to the “Varian Advanced Exchange Service” where the faulty controller is replaced by a refurbished one.

If the controller needs to be scraped, proceed to do so in compliance with the specific national norms.

DISPOSAL

Meaning of the "WEEE" logo found in labels
The following symbol is applied in accordance with the EC WEEE (Waste Electrical and Electronic Equipment) Directive.
This symbol (**valid only in countries of the European Community**) indicates that the product it applies to must NOT be disposed of together with ordinary domestic or industrial waste but must be sent to a differentiated waste collection system.
The end user is therefore invited to contact the supplier of the device, whether the Parent Company or a retailer, to initiate the collection and disposal process after checking the contractual terms and conditions of sale.



ERROR MESSAGES

For certain types of failure, the controller performs an autodiagnostic test and displays one of the messages indicated in the following table.

MESSAGE	DESCRIPTION	CORRECTIVE ACTION
HIGH VOLTAGE 1 OR 2 ERRORS		
HV(X) ERROR PANEL INTERLOCK	HV switched-off by an interlock received from the front panel or cover. ("HV ENABLE" switch set to OFF or unit cover removed)	1. Set the "HV ENABLE" switch to ON and repeat the H.V. power on procedure. 2. Make sure that the cover is installed correctly.
HV(X) ERROR REMOTE INTERLOCK	HV powered off due to an interlock received from Remote I/O.	1. Check that the loopback plugs with the external interlock jumpered are installed. 2. Make sure that the external interlock is closed.
HV(X) ERROR CABLE INTERLOCK	HV power off caused by an HV cable interlock.	1. If the pump uses an HV cable with safety interlock, check that the connector at the pump end is inserted correctly and that the loopback pin at the unit end is inserted into the related socket on the rear panel. 2. If the pump uses an single pole HV cable without interlock, check that the jumper is correctly inserted between the Interlock cable HV plug and ground.
HV(X) ERROR HV NOT FOUND	HV circuit has not been detected.	Repeat the Dual power on procedure; if the problem persists, contact Varian for repair or exchange.
HV(X) ERROR HV FAULT	HV powered off caused by an HV circuit failure.	Contact Varian for repair or exchange.
HV(X) ERROR HV OVERTEMP.	Temperature sensors inside the Dual have detected a temperature which exceeds the safety threshold.	1. Make sure that the environmental temperature of Dual controller operation is not over 45 º. 2. Make sure that the ventilation slots on the cover are not obstructed. 3. Make sure that the fan blades rotate freely and that the air channeled inside the Dual controller is not blocked by dust or foreign matter. Wait a few minutes for the temperature inside the unit to cool down and then repeat the HV power on procedure.
HV(X) ERROR REMOTE I/O NOT FOUND	Remote I/O card not detected.	Repeat the Dual power on procedure; if the problem persists, contact Varian for repair or exchange.
HV(X) ERROR R. I/O FAULT	Remote I/O circuit failure.	1. Make sure that the Remote I/O external connectors are connected as indicated in this manual. 2. Repeat the Dual power on procedure; if the problem persists, contact Varian for repair or exchange.
HV(X) ERROR PROTECT	The overcurrent protection was triggered with the "PROTECT" mode of operation selected.	If necessary, select the START mode so that the controller can work until the short circuit current is reached.
HV(X) ERROR SHORT CIRCUIT	A short circuit was detected on the H.V. output.	1. Check the integrity of the HV cable. 2. Remove cable from ion pump and check if there is a short circuit in pump or cable.

MESSAGE	DESCRIPTION	CORRECTIVE ACTION
HV(X) ERROR OVER VOLT/CURR	Incorrect voltage and current values were detected on the H.V. output. This error indicates a malfunction of the H.V. control circuit.	Repeat the Dual power on procedure; if the problem persists, contact Varian for repair or exchange.
MESSAGE	**DESCRIPTION**	**CORRECTIVE ACTION**
HV(X) ERROR ZERO MEAS	The Dual controller's microprocessor has detected that both voltage and current were missing from the H.V. output that should have been active.	Repeat the Dual power on procedure; if the problem persists, contact Varian for repair or exchange.
GAUGE 1 OR GAUGE 2 ERRORS		
GAUGE(X) ERROR PANEL INTERLOCK	The "HV ENABLE" switch is set to OFF or the cover has been removed from the unit.	1. Set the "HV ENABLE" switch to ON and then repeat the power on procedure. 2. Make sure that the cover is installed correctly.
GAUGE(X) ERROR GAUGE NOT FOUND	The microprocessor does not detect the Gauge control H/W.	Switch the Dual controller power supply unit off and then on again. If the problem persists, contact Varian for repair or exchange.
GAUGE(X) ERROR GAUGE FAULT	A malfunction has been detected in the connected Eyesys Gauge.	1. Check the connection cable between the Dual controller and Gauge. 2. Make sure that the Gauge works correctly when disconnected from the Dual controller. If the problem persists contact Varian for repair or exchange.
GAUGE(X) ERROR GAUGE NOT CONNECT	The Gauge has been disconnected from the Dual controller.	Reconnect the Gauge and repeat the power on procedure.
SYSTEM ERRORS		
SYSTEM ERROR ER 1 ÷ 10	For Varian Service diagnostic purpose only. Switch OFF and ON again the power to the DUAL system, if the problem persists, contact Varian for repair or exchange	

DUAL CONTROLLER DESCRIPTION

The Dual Controller base is available in versions which differ in the factory set input voltage and in the internal configuration.

- Models 929-7000/1/2/3 and 929-7008/09/10/11 require an input voltage from 100 to 120 Vac, frequency of 50/60 Hz,
- Models 929-7004/5/6/7 and 929-7012/13/14/15 require an input voltage from 200 to 240 Vac, frequency of 50/60 Hz.

The models are provided with a front panel with an LCD alphanumeric display to indicate the operating conditions/parameters of the Ion pump and a keyboard, and a rear panel with input/output connectors.

The figure below shows the Dual controller.

The controller unit can be operated via:
- Front panel switches
- Remote signals via rear panel connectors
- RS 232/485/422 serial link (option).

A maximum power of 420 W is delivered simultaneously on the two channels, while a maximum power of 400 W is delivered on a single channel. If a total of more than 420 W is requested, the power delivered by the controller is distributed by means of an appropriate algorithm resident in the DSP.
The Dual is a power supply designed to meet a wide range of requirements.

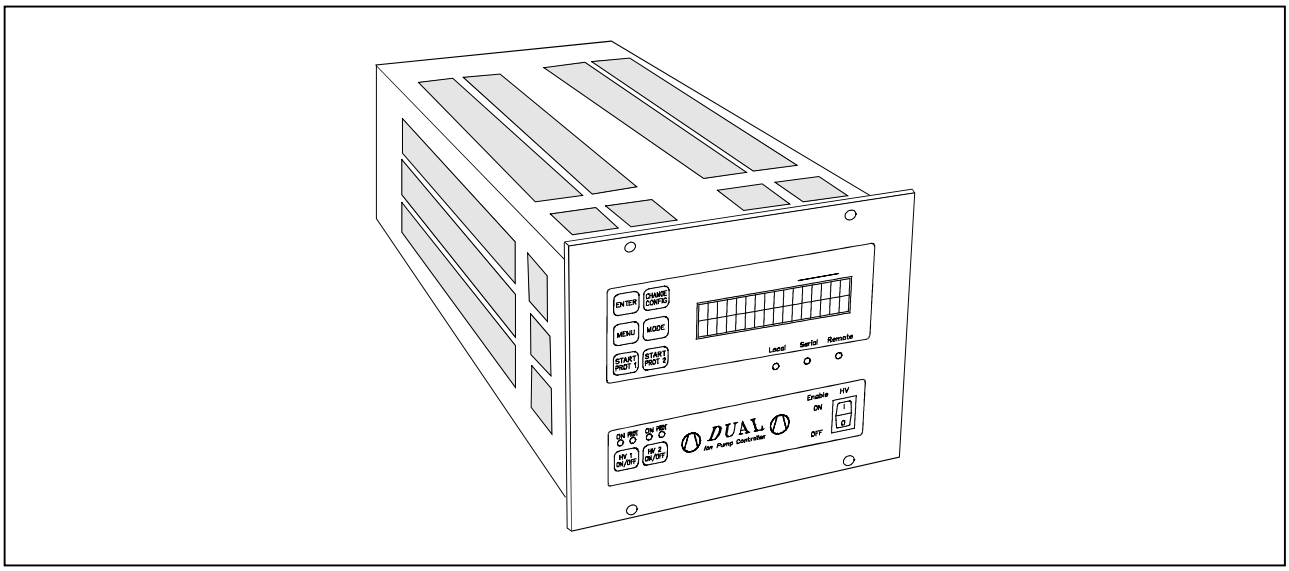
It is a compact unit, specifically designed to operate ion pumps with both positive and negative polarity from 20 l/s to 500 l/s and up to 400 W output power.

The unit is programmed with pre-defined pump settings and the user can tailor for his purpose the voltage, short circuit current, maximum power, pressure versus current curve for one more pump not included in the pre-defined type of pumps. Using a patented operation principle, the controller is capable of reading pressure down to the 10^{-11} Torr range, while optimising the pumping speed in the entire operating range.

Algorithm for the Distribution of the Available Power

During the start-up phase, priority is given to the pump that is started first. Consequently, this pump is provided with all the power required while the second pump is provided with the power that remains.
Upon completion of this start-up phase the controller, if necessary, will proportionally distribute the available power according to the maximum power that the pumps can require.
If more than 420 W are requested, to reach a stabilized condition the controller will act on the pump power supply voltage so as to maintain constant the power delivered.

If one of the two pumps enters into the short circuit range the start phase is resumed. In this case, priority is assigned to the pump that is in the short circuit range; if both pumps are in this range, priority is assigned to the one that entered this range first.
If the HV output voltage drops below 150 V with a current equivalent to 80% of the short circuit value for a time frame exceeding 5 seconds, the related output is disabled and the following message is displayed: HV (X) ERROR SHORT CIRCUIT.



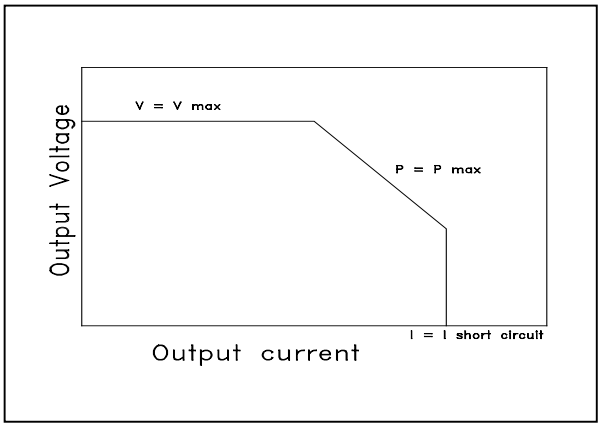
Dual Controllers

CONTROLLER SPECIFICATIONS

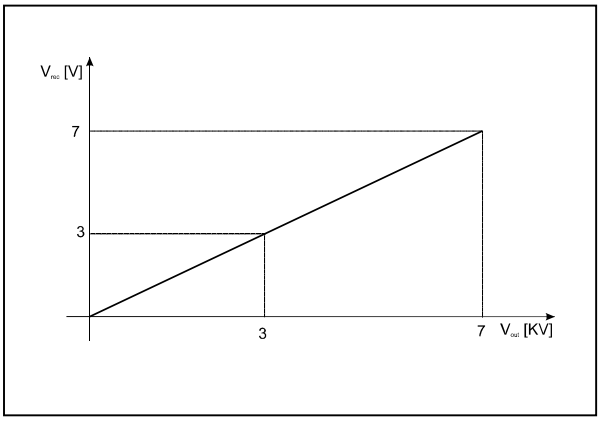
Input:	
Voltage	100 to 120 Vac / 200 to 240 Vac
Frequency	50 – 60 Hz
Power	600 VA maximum
Output for pump:	
Voltage	± 7,000 Vdc +2 –10% maximum programmable via software between 3,000 V and 7,000 V at 100 V steps
Short circuit current	400 mA
Power	400 W maximum (programmable via software between 100 W and 400 W at 10 W steps)
Output current	400 mA ± 10% (programmable via software between 100 mA and 400 mA at 10 mA steps)
Operating temperature	0 °C to +45 °C
Storage temperature	-20 °C to +70 °C
Fuse:	
Line voltage	Two 4 A(slow blow) for 200 or 240 input Voltage Two 8A (slow blow) for 100 or 120 input Voltage
Voltage measurement	Resolution ≤ 50 V Accuracy ± 2% of Vmax
Current measurement	Measurement range: 10 nA to 400 mA Resolution: 10 nA Accuracy: I >10 μA ± 2%, I < 10 μA ± 10%
Pressure Analog REC. OUT	0 to +5 Vdc log. See Rec Out diagram. Minimum recorder input impedence 1 MOhm
Voltage Analog REC. OUT	0 to +7 Vdc line. See Rec Out diagram. Minimum recorder input impedence 1 MOhm
Measurement updates	On the display: $t_r \leq 2$ s On the recorder: $t_r \leq 0.1$ s
In compliance with norms	EN 55011 class A group 1 EN 61000-3-2 (Harmonic Current Emission) EN 61000-3-3 (Flicker) EN 61000-4-2 (ESD) EN 61000-4.4 (Burst) EN 61000-4.3 (Radiated RF immunity) EN 61010-1 (Safety)
Installation category	II
Pollution degree	2
Interconnecting cables	Power cord (3-wire, 3-meter long) with European or US plug
Weight (both models)	With 1 H.V.10 Kg (22.4 lbs) With 2 H.V. 11.5 Kg (25.8 lbs)

Output Voltages

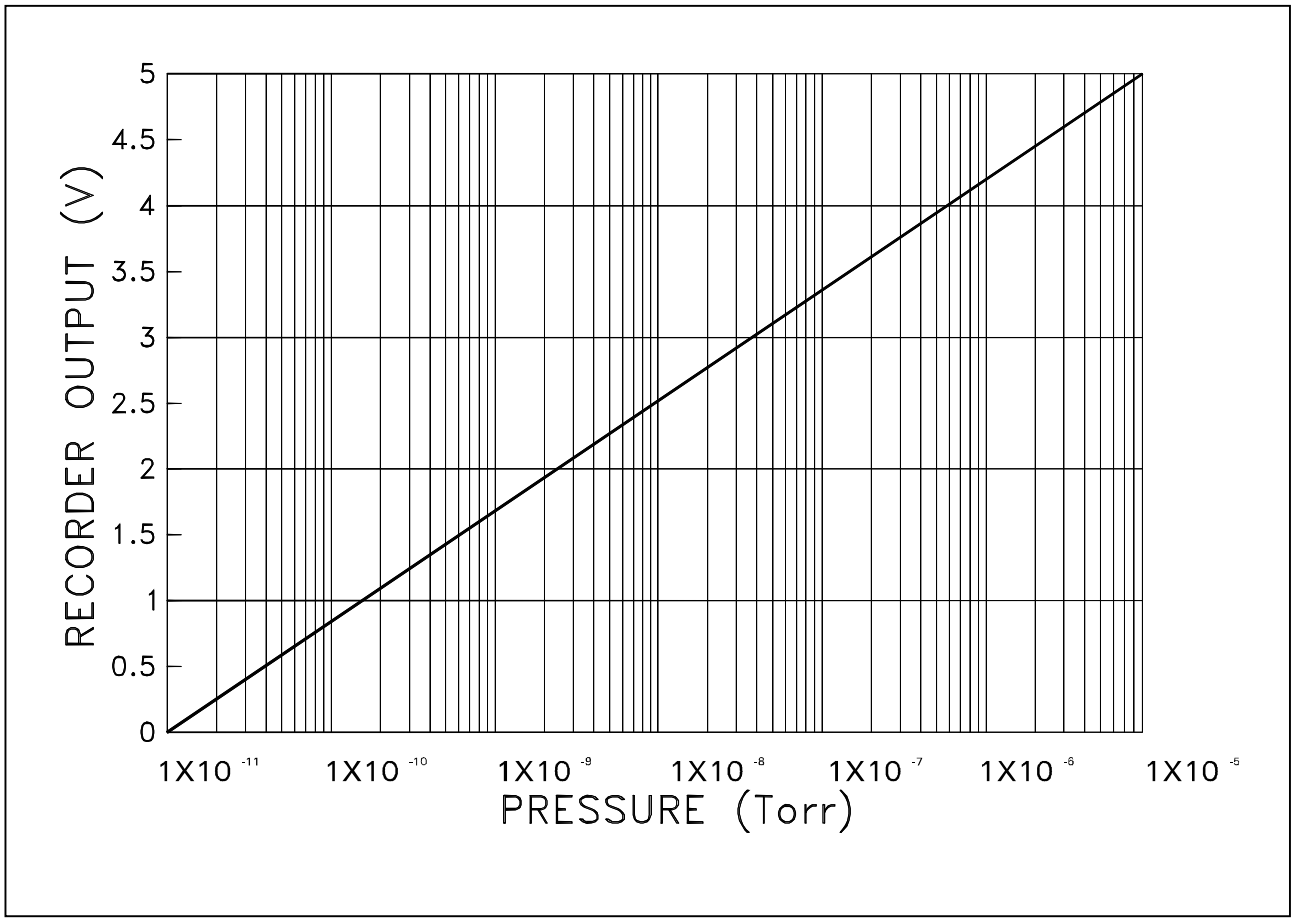
Provided below are the output voltage diagrams.



Output Voltage VS Current Curve



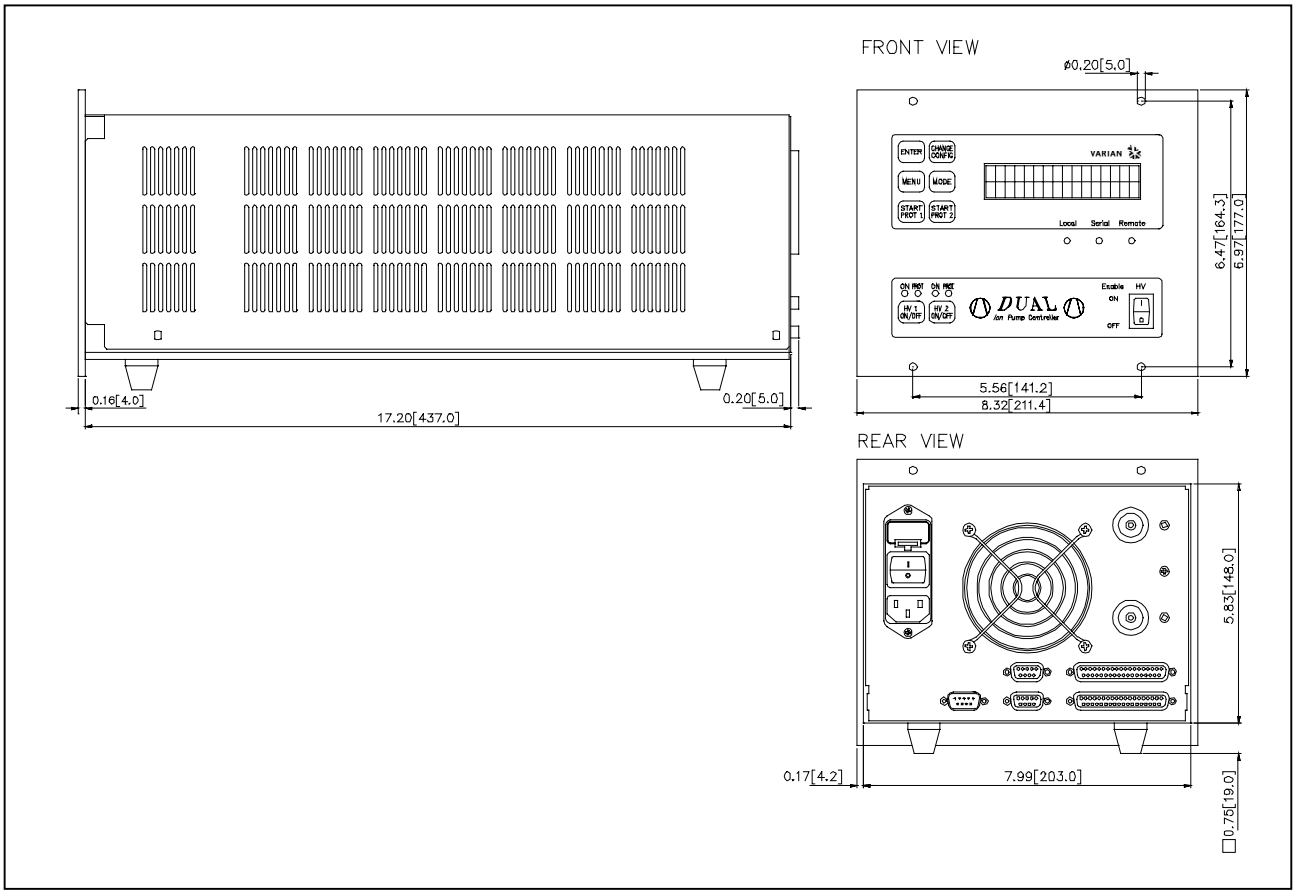
Recorder Output Voltage



Recorder Output Pressure

CONTROLLER OUTLINE

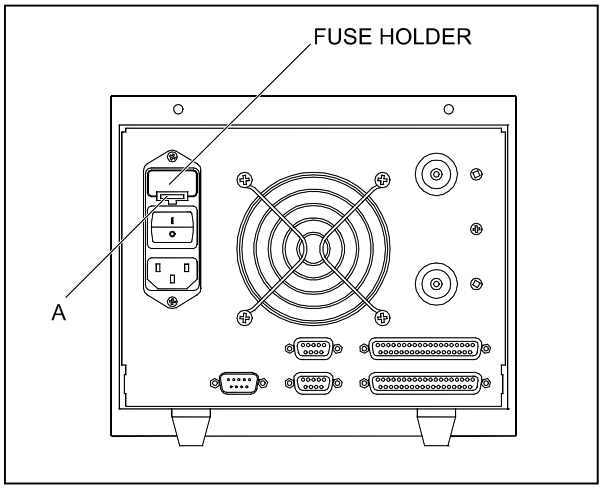
The outline dimensions for the Dual controllers are shown in the following figures:



Controller Model Dimensions

FUSE HOLDER

The following figure shows the location of this assembly.



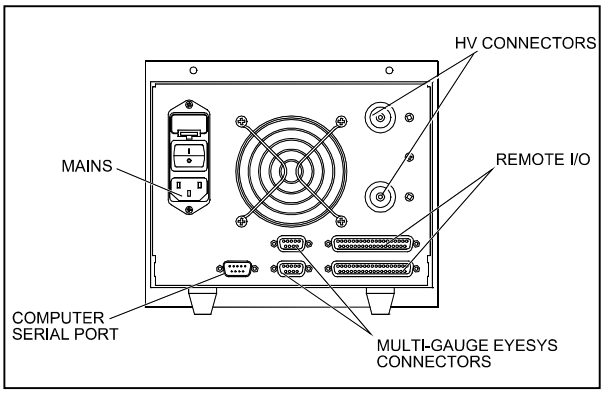
Rear Panel

Proceed as follows to replace one or both fuses:

- Remove the assembly by levering in position **A** with a small screwdriver.
- Replace the fuse
  Use only T-type fuses of the following characteristics:
  - 100-120 Vac 8 A
  - 200-240 Vac 4 A

INTERCONNECTIONS

The following figure shows the Controller interconnections.



Controller Interconnection

- Female Remote I/O connector
- Optional female Gauge connector(s)
- Optional serial male connector

START MODE OF OPERATION

Pump size/type	Max. voltage and polarity	Short circuit current	Max. power
Models with negative H.V. card			
500 StarCell®	-7000V	400 mA	400 W
300 StarCell	-7000V	400 mA	400 W
150 StarCell	-7000V	300 mA	400 W
75, 55, 40 StarCell	-7000V	250 mA	200 W
20 StarCell	-7000V	150 mA	150 W
Spare	-7000V	400 mA	400 W
Models with positive H.V. card			
500 Diode Noble Diode	+7000V	400 mA	400 W
300 Diode Noble Diode	+7000V	400 mA	400 W
150 Diode Noble Diode	+7000V	300 mA	400 W
75 Diode Noble Diode 55 Diode Noble Diode 40 Diode Noble Diode	+7000V	250 mA	200 W
20 Diode Noble Diode	+7000V	150 mA	150 W
Spare	+7000V	400 mA	400 W

Protect Mode of Operation

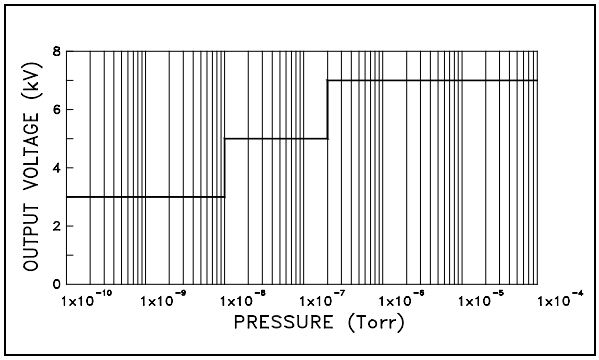
When the current value exceeds the trip current for more than 0.2 seconds, the power supply turns off the high voltage, and an error message is displayed.

PUMP SIZE/TYPE	PROTECT TRIP CURRENT
Models with negative H.V. card	
500 StarCell	100 mA
300 StarCell	100 mA
150 StarCell	50 mA
40 - 55 - 75 StarCell	30 mA
20 StarCell	20 mA
Spare	400 mA
Models with positive H.V. card	
500 Diode/Noble Diode	100 mA
300 Diode/Noble Diode	100 mA
150 Diode/Noble Diode	50 mA
40 - 55 - 75 Diode/Noble Diode	30 mA
20 Diode/Noble Diode	20 mA
Spare	400 mA

Step Mode of Operation

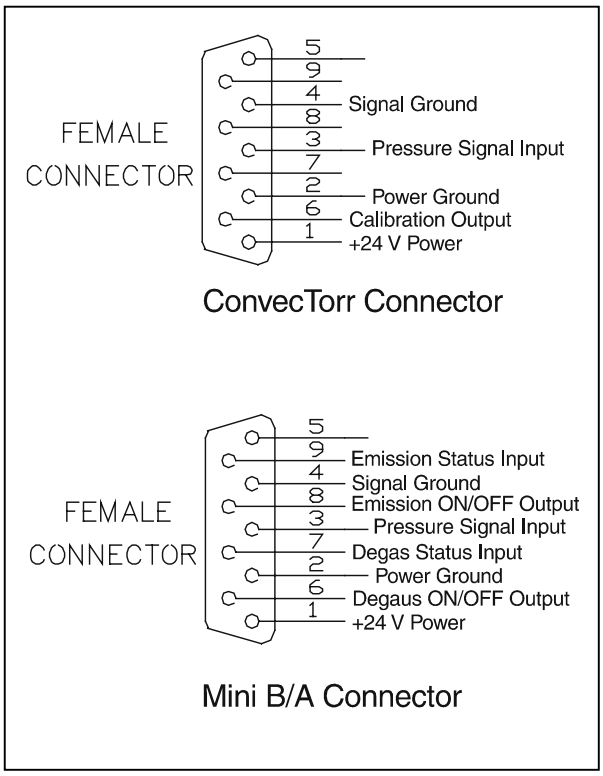
When the current reaches the value listed in the table, the controller changes the voltage output.

Pump size/type	Current value for switching from 7.0 to 5 KV	Current value for switching from 5 to 3 KV
Models with negative H.V. card		
500 StarCell	9.0×10^{-4} A	2.5×10^{-5} A
300 StarCell	5.5×10^{-4} A	1.6×10^{-5} A
150 StarCell	3.0×10^{-4} A	8.5×10^{-6} A
40, 55, 75 StarCell	1.3×10^{-4} A	3.8×10^{-6} A
20 StarCell	6.5×10^{-5} A	1.9×10^{-6} A
Models with negative H.V. card		
Spare	User selection	User selection
Models with positive H.V. card		
500 Diode Noble Diode	1.4×10^{-3} A	3.9×10^{-5} A
300 Diode Noble Diode	7.2×10^{-4} A	2.1×10^{-5} A
150 Diode Noble Diode	3.6×10^{-4} A	9.5×10^{-6} A
40, 55, 75 Diode Noble Diode	2.2×10^{-4} A	6.7×10^{-6} A
20 Diode Noble Diode	2×10^{-4} A	2.7×10^{-6} A
Spare	User selection	User selection



Output voltage change-over vs pressure

Optional Gauge Connector



Connector

The following table gives the connector pinout in the **ConvecTorr** configuration.

Pin	ConvecTorr
1	+24 V Power
2	Power Gound
3	Pressure Signal Input
4	Signal Ground
5	N.C.
6	Calibration Output
7	N.C.
8	N.C.
9	N.C.

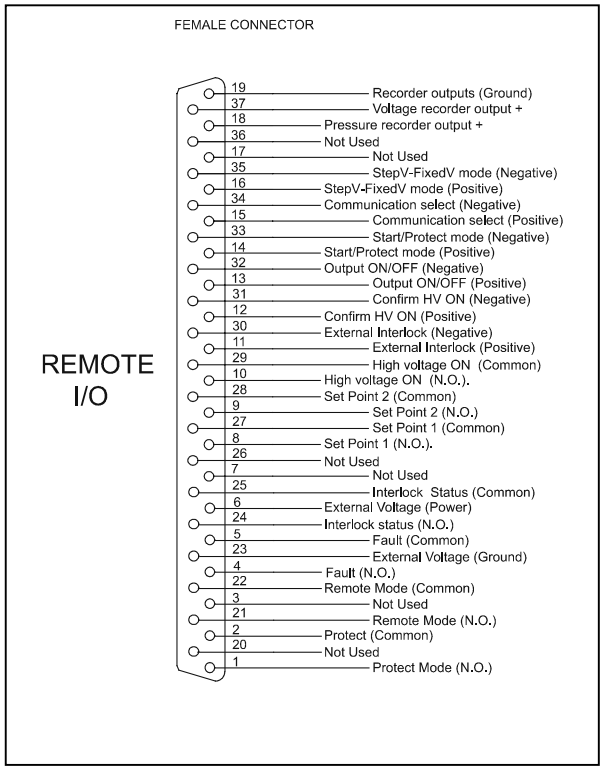
NOTE

Connecting cables between EYESYS GAUGES and DUAL available on request. See "Accessories List" at the end of the Instruction Manual.

The following table gives the connector pinout in the **Mini B/A** configuration.

Pin	Mini B/A
1	+24 V Power
2	Power Ground
3	Pressure Signal Input
4	Signal Ground
5	N.C.
6	Degas ON/OFF Output
7	Degas Status Input
8	Emission ON/OFF Output
9	Emission Status Input

Remote I/O Connector

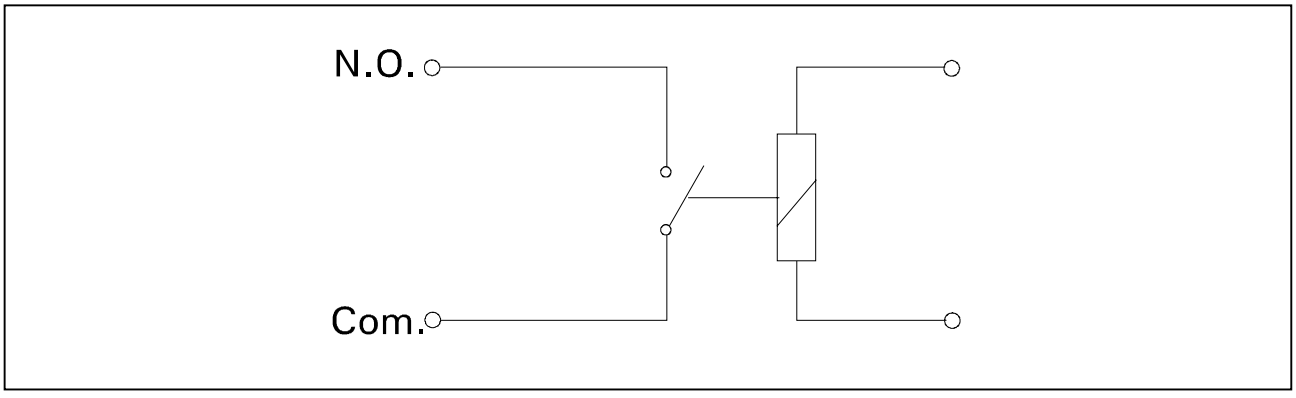


Remote I/O Connector

The following figure gives the connector pinout with related signals description.

Female Remote I/O Connector Output Signal

Pin	Signal	Maximum Ratings	Description
10 N.O 29 common	High Voltage on Digital output	Relay contact: 0.5A at 250VAC, 0.2A at 150VDC, 0.5A at 30VDC	HV On: Closed HV Off: Open
9 N.O 28 common	Set point 2 Digital output	Relay contact: 0.5A at 250VAC, 0.2A at 150VDC, 0.5A at 30VDC	P<Pthreshold set point 2: Closed P>Pthreshold set point 2: Open
8 N.O 27 common	Set point 1 Digital output	Relay contact: 0.5A at 250VAC, 0.2A at 150VDC, 0.5A at 30VDC	P<Pthreshold set point 1: Closed P>Pthreshold set point 1: Open
24 N.O 25 common	Interlock status Digital output	Relay contact: 0.5A at 250VAC, 0.2A at 150VDC, 0.5A at 30VDC	Interlock OK: Closed Interlock FAULT: Open
4 N.O 5 common	Fault Digital output	Relay contact: 0.5A at 250VAC, 0.2A at 150VDC, 0.5A at 30VDC	HV Off after FAULT: Closed Other condition: Open
21 N.O 22 common	Remote mode Digital output	Relay contact: 0.5A at 250VAC, 0.2A at 150VDC, 0.5A at 30VDC	Serial mode: Closed Other modes: Open
1 N.O 2 common	Protect mode Digital output	Relay contact: 0.5A at 250VAC, 0.2A at 150VDC, 0.5A at 30VDC	Protect ON: Closed Protect OFF: Open
18 positive 19 ground	Pressure recorder output Analog output	0V to 5V Min. impedance 1 MΩ	0V $\rightarrow$ P $\leq 10^{-11}$ Torr 5V $\rightarrow$ P $=10^{-5}$ Torr Logarithmic
37 positive 19 ground	Voltage recorder output Analog output	0V to 7V Min. impedance 1 MΩ	0V $\rightarrow$ 0KV 7V $\rightarrow$ 7KV Linear
6 power 23 ground	External voltage Power	10-30VAC, 1.5W	External voltage to power the optoisolated input
17, 36	Not used		
3, 7, 20, 26	Not used		



Typical Output Connection

Female Remote I/O Connector Input Signal

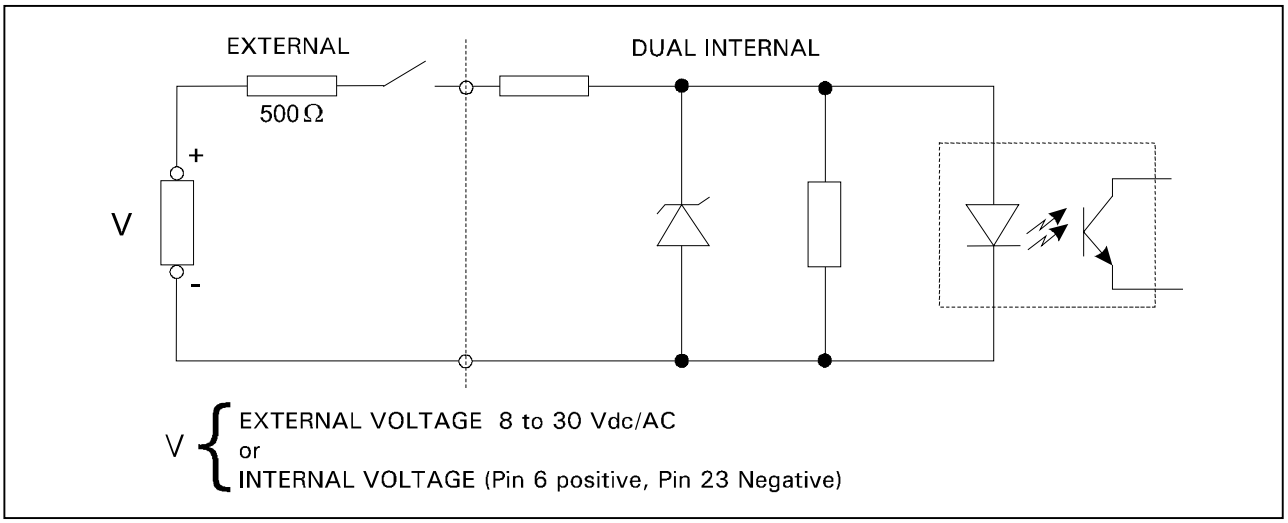
Pin	Signal	Maximum Ratings	Description
11 positive 30 negative	External interlock Digital input	8 to 30 VDC/VAC 15 mA max	Interlock closed: The H.V. output of the corresponding H.V. channel is enabled. Interlock open: The H.V. output of the corresponding H.V. channel is disabled.
12 positive 31 negative	Confirm HV ON Digital input	8 to 30 VDC/VAC 15 mA max	Active on the positive edge. If a positive edge is detected, the H.V. output is switched on if both interlock and output ON/OFF are closed.
13 positive 32 negative	Output ON/OFF Digital input	8 to 30 VDC/VAC 15 mA max	Output ON/OFF open: The H.V output of the corresponding channel is switched OFF. Output ON/OFF closed: The H.V. output of the corresponding channel is enabled.
14 positive 33 negative	Start/Protect mode Digital input	8 to 30 VDC/VAC 15 mA max	Closed: Protect selected Open: Start selected
15 positive 34 negative	Communication select Digital input	8 to 30 VDC/VAC 15 mA max	Active on the positive edge. If a positive edge is detected, the DUAL switches alternatively from Serial Communication operation to Remote I/O operation and vice versa.
16 positive 35 negative	StepV FixedV mode Digital input	8 to 30 VDC/VAC 15 mA max	Closed: Step V Open: Fixed V

NOTE

The External Interlock, it will operates independently from the operational mode (Local, Remote Communication, Remote I/O). In any operational mode, the Interlock must be closed to start the pump.

NOTE

The input signals are only active if the operational mode is set to Remote. The output signals are active in all operational modes.



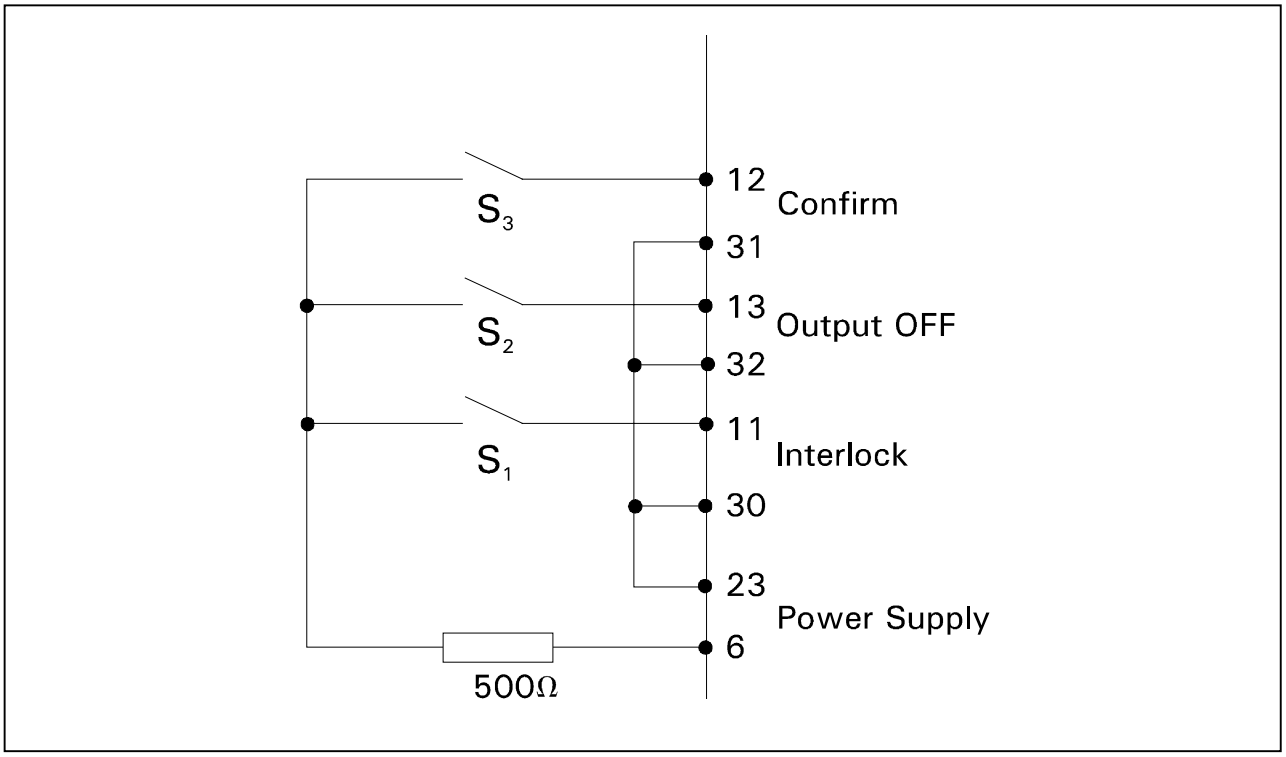
Typical Input Connection

Remote Power On

Proceed as follows to turn on the HV from the Remote I/O Connection:

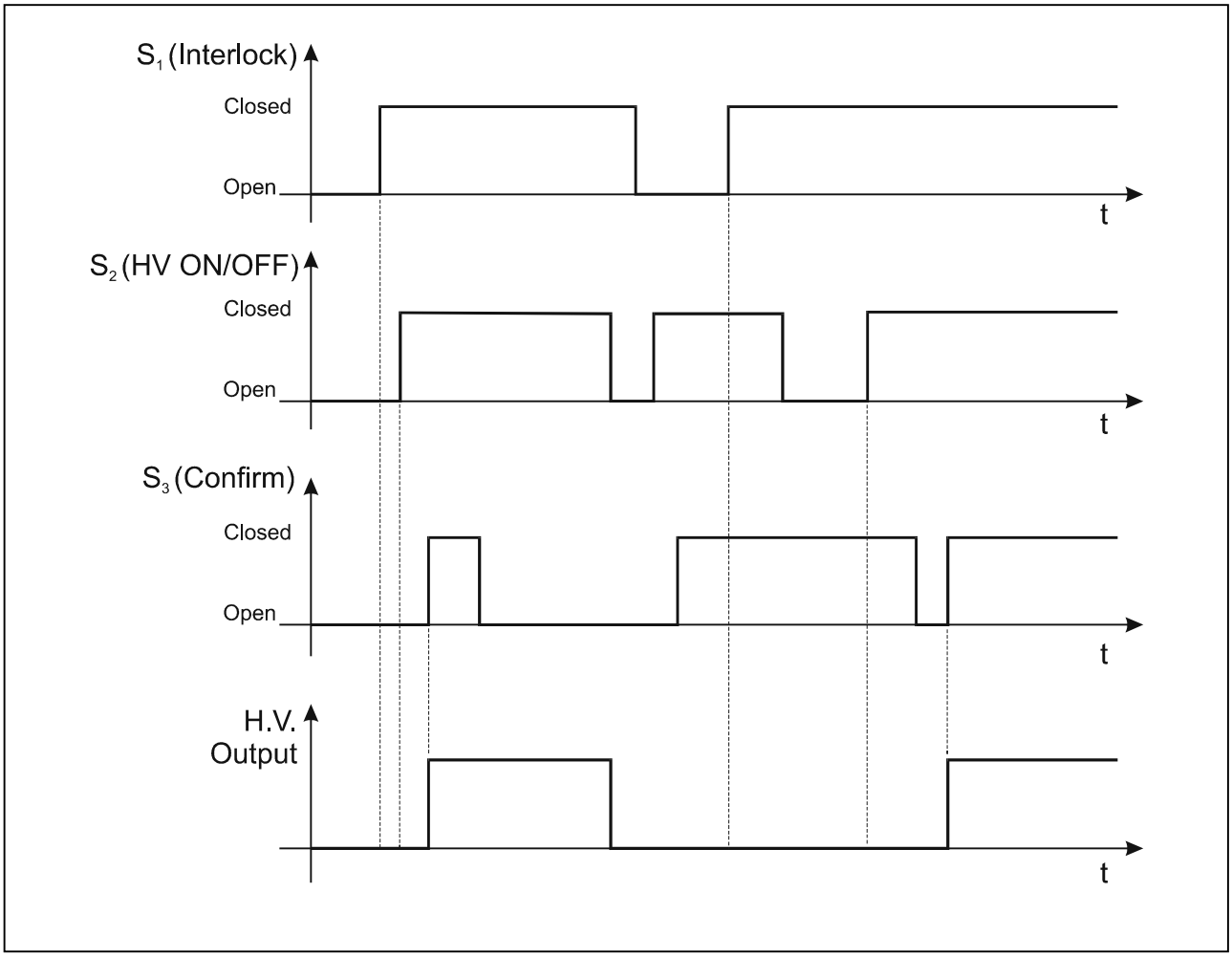
1) Switch on the DUAL.
2) Switch the unit to the "Remote I/O" mode of operation by pressing the related button on the front panel.
3) Connect the HV cable with the corresponding cable interlock
4) Press the "HV ENABLE" button on the front panel.
5) Close the Interlock contact on the corresponding Remote I/O connector (pins 11 – 30).
6) Close the Output On/Off contact on the corresponding Remote I/O connector (pins 13-32)
7) Close the corresponding Confirm Contact on the Remote I/O Connector (12-31).

The following figures show possible interconnections that switch on the HV through the Remote I/O.



Remote I/O Connection DUAL

Provided below is the H.V. switch-on timing sequence



Timing

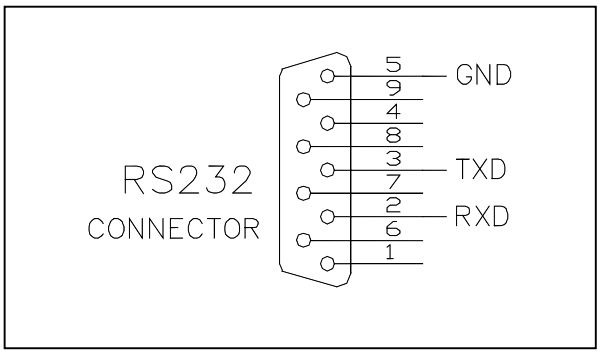
NOTE

If S1 and S2 are not both closed, a transition (Open to Closed) of S3 does not switch-on the H.V.

Optional Male Serial Connector

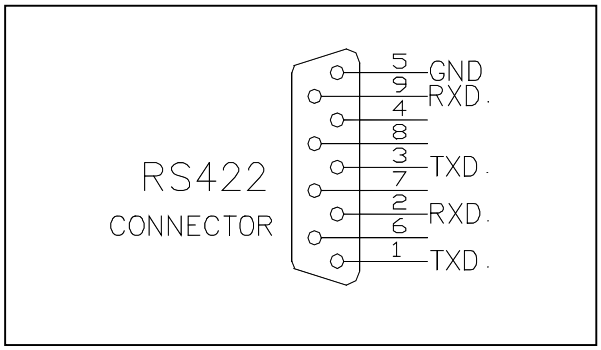
The Dual controller uses an RS 232/422/485 serial interface. The following tables provide this connector's pinout in the different configurations.

Pin	RS232
1	N.C.
2	Receive data
3	Transmit data
4	N.C.
5	Signal Ground
6	N.C.
7	N.C.
8	N.C.
9	N.C.



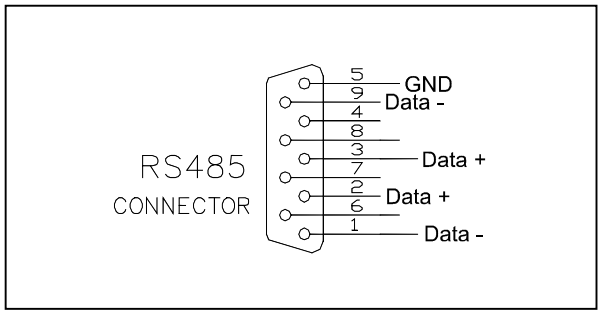
RS232 Connector

Pin	RS422
1	Transmit Data neg.
2	Receive Data pos
3	Transmit Data pos.
4	N.C.
5	Signal Ground
6	N.C.
7	N.C.
8	N.C.
9	Receive Data neg.



RS422 Connector

Pin	RS485
1	Data neg.
2	Data pos
3	Data pos
4	N.C.
5	Signal Ground
6	N.C.
7	N.C.
8	N.C.
9	Data neg.



RS485 Connector

USAGE

General

Make all vacuum manifold and electrical connections and refer to Ion pump instruction manual before to operating the DUAL controller.

WARNING!

To avoid injury to personnel and damage to the equipment, if the pump is lying on a table make sure it is steady. Never operate the pump if the pump inlet is not connected to the system or blanked off.

Abbreviations

This section provides the notations that are used during message display.

- Unit of measure

Torr	pressure
mbar	pressure
Pa	pressure
Volt	voltage
V	voltage
mA	current
Amp	current
A	current
W	power

- Abbreviations

HV1	High Voltage 1
HV2	High Voltage 2
mG1	mini Gauge 1
mG2	mini Gauge 2
SC1	Serial Comm.

STARTUP

- Plug the controller power cord into a suitable power source.
- Set the main power switch on the rear panel to the ON position
- The display comes on and the following is displayed:

	*	*	*	*		D	U	A	L		*	*	*	*	
	I	n	i	t	i	a	l	i	z	e	.	.	.		

Display of the µC software version

	*	*	*	*		D	U	A	L		*	*	*	*	
		u	C		v	e	r	.		1	.	0			

Display of the DSP software version

	*	*	*	*		D	U	A	L		*	*	*	*	
		D	S	P		v	e	r	.		1	.	0		

NOTE

Upon completion of the initialization routine, the Dual controller will return to the condition it was in when powered off. If the high voltage was on at power off, when powered back on again the Dual controller will re-enable it if allowed to do so by all the interlocks.

OPERATING MODES

Messages Associated to the Mode Button

The MODE button is used to change the Dual controller's current operating mode. Pressing the MODE button displays the mode currently set. Pressing this key cyclically alternates between one of the three modes available: LOCAL, REMOTE I/O, SERIAL, as shown below.

	O	p	e	r	a	t	i	n	g		M	o	d	e	
					L	O	C	A	L						

	O	p	e	r	a	t	i	n	g		M	o	d	e	
			R	E	M	O	T	E		I	/	O			

	O	p	e	r	a	t	i	n	g		M	o	d	e	
					S	E	R	I	A	L					

The three LEDs located underneath the LCD indicate the operating mode that the controller is in.

NOTE

When H.V. is ON, it is not possible to change the Dual controller's operating mode.

High Voltage Commands

If after being powered on the Dual controller is set to the LOCAL mode, the LCD will display a message concerning the pump(s) selected.

If, for example, the controller has only one H.V. channel, the following is displayed:

	H	V	1				5	0	0		S	C	/	T	r

If, for example, the controller has two H.V. channels, the following is displayed:

H	V	1				5	0	0		S	C	/	T	r
H	V	2				3	0	0		S	C	/	T	r

To switch-on the high voltage all the interlocks (cable, Remote I/O connector and front panel) must first be closed; then press the HV1 and/or HV2 buttons.

The voltage and pressure values will be displayed if only one H.V. card is present.

If two cards are present, the display will only show the values of the two voltages.

The following is displayed if only one card is present:

H	V	1				-	7	0	0	0		V	o	l	t
		2	.	5		E	-	9		T	o	r	r		

The following is displayed if two cards are present:

H	V	1				-	7	0	0	0		V	o	l	t
H	V	2				-	5	0	0	0		V	o	l	t

The lighting of the LED located above the H.V. On/Off button continuously informs the operator whether the high voltage is present or not.

By pressing the CHANGE CONFIG button, the display will show in sequence the current and pressure values of the pump, and the pressure values of the Eyesys Gauges if installed.

The following is displayed if an HV card is installed:

H	V	1			6	.	5		E	-	6		A	m	p
		3	.	0		E	-	9		T	o	r	r		

The following is displayed if two H.V. cards are installed:

H	V	1			6	.	5		E	-	6		A	m	p
H	V	2			3	.	5		E	-	6		A	m	p

If one H.V. card is installed (with multigauge option), pressing the CHANGE CONFIG button again displays the following:

m	G	1		6	.	0	E	-	7			T	o	r	r
m	G	2		3	.	6	E	-	9			T	o	r	r

If two H.V. cards are installed the following are displayed:

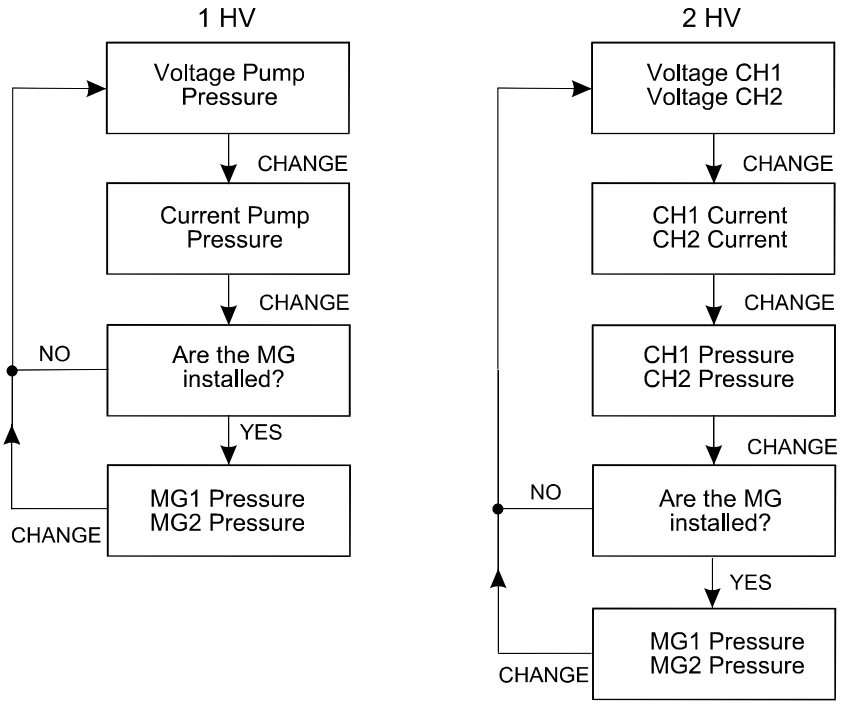
H	V	1		3	.	7		E	-	9		T	o	r	r
H	V	2		3	.	9		E	-	8		T	o	r	r

In a dual H.V. card and multigauge configuration, pressing the CHANGE CONFIG button again displays the multigauge pressure as indicated below.

m	G	1		3	.	8	E	-	8			T	o	r	r
m	G	2		5	.	6	E	-	9			T	o	r	r

Pressing the CHANGE CONFIG button again returns to the voltage value display.

The same indication can be seen on the following flow diagram:



The START/PROT 1 and START/PROT 2 buttons enable/disable the PROTECT operating mode; when this mode is enabled, the corresponding LED on the front panel comes on.

NOTE

The START PROT 1 and 2 buttons are active even with H.V. set to ON.

In the START mode, the controller will continue to provide high voltage regardless of the current supplied.
The high voltage is disabled if during operation in the PROTECT mode the current delivered exceeds the $I_{protect}$ level.

UNIT CONFIGURATION

Using the Menu button accesses this configuration menu.

NOTE

If the high voltage is enabled the controller settings cannot be modified; they can only be changed with H.V set to Off.

Messages Associated to the Menu Button

When pressing the Menu button, the device enters into the cycle configuration program that must be terminated in order to return to the Main Menu.
The unit automatically exits from this menu if nothing is pressed within a preset time of 15 sec.

Pressure Unit selection

When pressing Main menu button the first time it is possible to select the pressure unit of measure; in fact, the display shows the last unit set. Pressing the CHANGE button allows to change the unit of measure; the following units can be selected:

mbar, Torr and Pascal

	P	**R**	**E**	**S**	**S**	**U**	**R**	**E**		**U**	**N**	**I**	**T**		
						T	**O**	**r**	**r**						*

Confirm the made selection by pressing the ENTER button.

Channel Selection

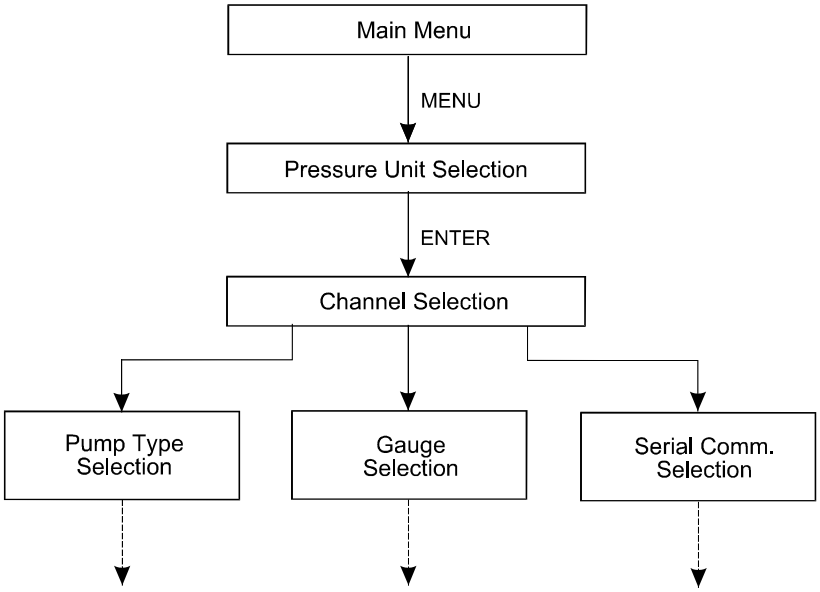
	S	E	L	E	C	T		C	H	A	N	E	L	
	H	I	G	H		V	O	L	T	A	G	E	1	

Press the CHANGE button to display the options available on the second row:

- HIGH VOLTAGE 1
- HIGH VOLTAGE 2
- GAUGE 1
- GAUGE 2
- SERIAL COMM.

Confirm by pressing the ENTER button.

The same information can be seen in the following flow-chart.



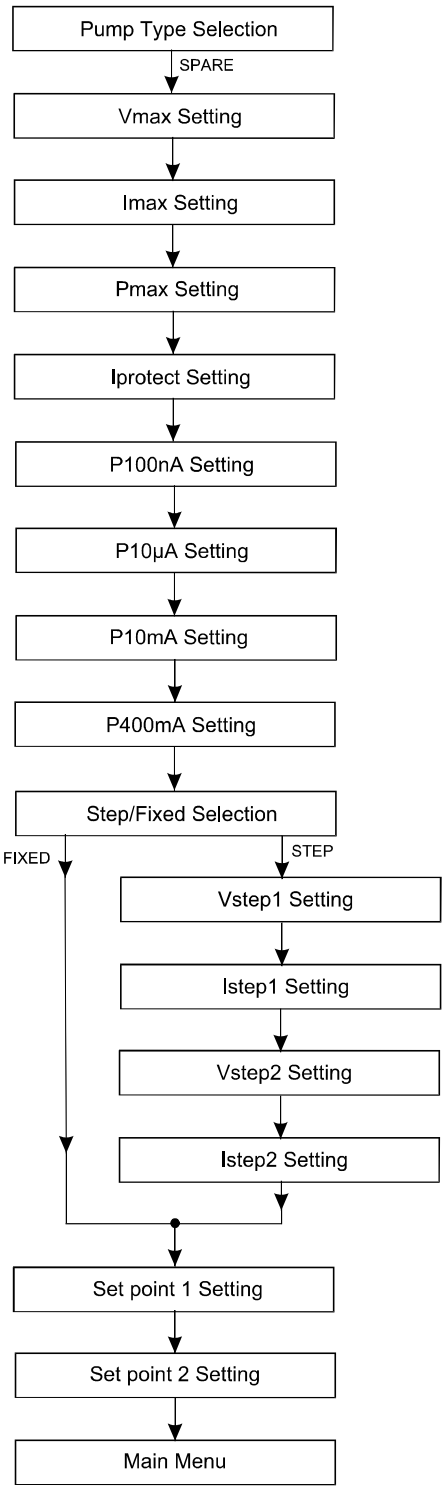
Pump Type Selection

The following message is now displayed.

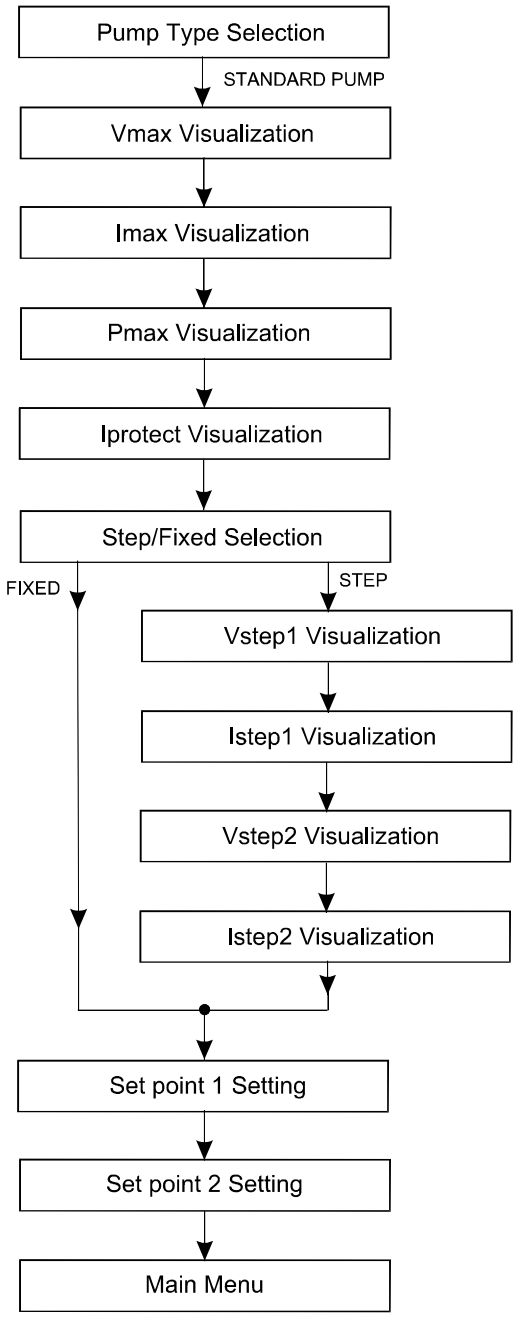
H	V	1		P	U	M	P		S	E	L	E	C	T	
			5	0	0		S	C	/	T	r				

Use the CHANGE button to select the pump, then confirm the selection made by pressing the ENTER button.

In case the Spare Pump is selected, the operations that can be done are shown in the following flow-chart:



In case a Standard Pump is selected, the parameters can just be read, and the operations that can be done are shown in the following flow-chart:



The same sequences can be seen in the following pages:

Vmax

H	V	1					V	m	a	x			(	V	)
					+	7	0	0	0						

Imax

H	V	1					I	m	a	x		(	m	A	)
						4	0	0							

Pmax

H	V	1					P	m	a	x			(	W	)
						4	0	0							

Iprotect

H	V	1		I	p	r	o	t	e	c		(	m	A	)
						1	0	0							

Spare Pump Pressure Reading Setting

H	V	1		P	1	0	0	n	A	(	T	o	r	r	)
		→	6	.	2		E	X	P		-	1	1		*

When this page is displayed the operator should store the pressure value corresponding to the pump current of 100 nA with 5000 V applied on the pump in use.
In other words, program the conversion table from current to press. Store the pressure value for other three pump current values (10 μa, 10 mA, 400 mA).

Since an exponential value is displayed, press the CHANGE button to change the mantissa of the pressure and then confirm by pressing the ENTER button; now press the CHANGE button to modify the exponent and then press ENTER to confirm the selection made.

Storing these values allows the Dual to convert the pump current into pressure values even if the operating voltage is different from 5000 V.
The correction factor due to the different voltage is automatically applied by the Dual software in order to obtain a continuous correct pressure reading.

Step/Fixed Operating Mode
(can be changed with any type of pump)

	H	V	1		O	p	e	r	.		M	o	d	e	
					F	I	X	E	D		V				

Or

	H	V	1		O	p	e	r	.		M	o	d	e	
					S	T	E	P			V				

If the STEP V mode is selected and the high voltage is disabled, the four parameters that regulate the operating mode (two voltage values and two current values) can be displayed and changed.

Vstep 1 (can be changed for the SPARE pump only)

H	V	1			V	s	t	e	p	1			(	V	)
					5	0	0	0							

Istep 1 (can be changed for the SPARE pump only)

H	V	1			I	s	t	e	p	1			(	A	)
			1	.	4		E	X	P		-	3			

Vstep 2 (can be changed for the SPARE pump only)

H	V	1			V	s	t	e	p	2		(	V	)	
					3	5	0	0							

Istep 2 (can be changed for the SPARE pump only)

H	V	1			I	s	t	e	p	2		(	A	)	
			5	.	3		E	X	P		-	6			

At this point the unit switches to the set-point selection menu; the set-points can be changed on all pump models.

Set-point 1 or Set-point 2 selection
(valid for all pumps)

H	V	1		S	e	t	P	t	1	(	T	o	r	r	)
		→	1	.	0		E	X	P		-	6			*

At this point it is possible to use the CHANGE and ENTER buttons to change and confirm the values for the mantissa and exponent.

Pressing the ENTER button to confirm the selection made returns you to the menu of the voltages on the two channels.

Messages Associated to the MiniGauge Menu Button

If GAUGE1 or GAUGE2 was set during the channel selection phase you can access the minigauge menu described below.

As in the case of the previous menu, also in this case use the CHANGE button to change the parameters and the ENTER button to confirm.

MiniGauge Type Selection

m	G	1		S	E	L	E	C	T		G	A	U	G	E
	N	o	t		I	n	s	t	a	l	l	e	d		

m	G	1		S	E	L	E	C	T		G	A	U	G	E
			C	o	n	v	e	c	t	o	r	r			

m	G	1		S	E	L	E	C	T		G	A	U	G	E
				M	i	n	i	-	B	/	A				

The Calibration message provided below is displayed only if Convectorr was previously selected.

m	G	1			C	A	L	I	B	R	A	T	I	O	N
						Y	E	S							

If you confirm YES, the display will guide you through atmospheric and High vacuum calibration.

The message Emission indicated below is displayed only if miniB/A was previously selected.

m	G	1					E	M	I	S	S	I	O	N
						O	F	F						*

Usually you can select between OFF and ON, but if the miniB/A is undergoing its power on phase the following message will be displayed:

m	G	1						E	M	I	S	S	I	O	N
			W	A	R	M		U	P	.	.	.			

The message for Degas ON/OFF selection is the following:

m	G	1									D	E	G	A	S
						O	F	F							*

The message for Gas Type selection is the following:

m	G	1						G	A	S		T	Y	P	E
						A	I	R							*

By using the CHANGE and ENTER buttons you can select and confirm one of the following options:

SPARE CORRECT.
AIR
HELIUM
HYDROGEN
OXYGEN

The message Gas Correction, shown below, is only displayed if the SPARE Correct option was previously selected.

m	G	1					G	A	S		C	O	R	R	.
					1	.	0	0							*

Auto Turn-on sequence

If 2 of miniB/A and 1 Convector Gauge are installed, the miniB/A can be powered on when the Convector pressure is below a predetermined threshold.

MiniB/A Gauge Auto On

m	G	1		A	u	t	o	O	n		G	A	U	G	E
							N	O							*

Auto On Pressure Threshold Selection

m	G	1		P	o	n	G	A	U	(	T	o	r	r	)
		→	1	.	0		E	X	P		-	2			*

Proceed as follows to activate the High Voltage in the event that the pressure measured by the MiniB/A Gauge is lower than a certain threshold.

High Voltage Auto On

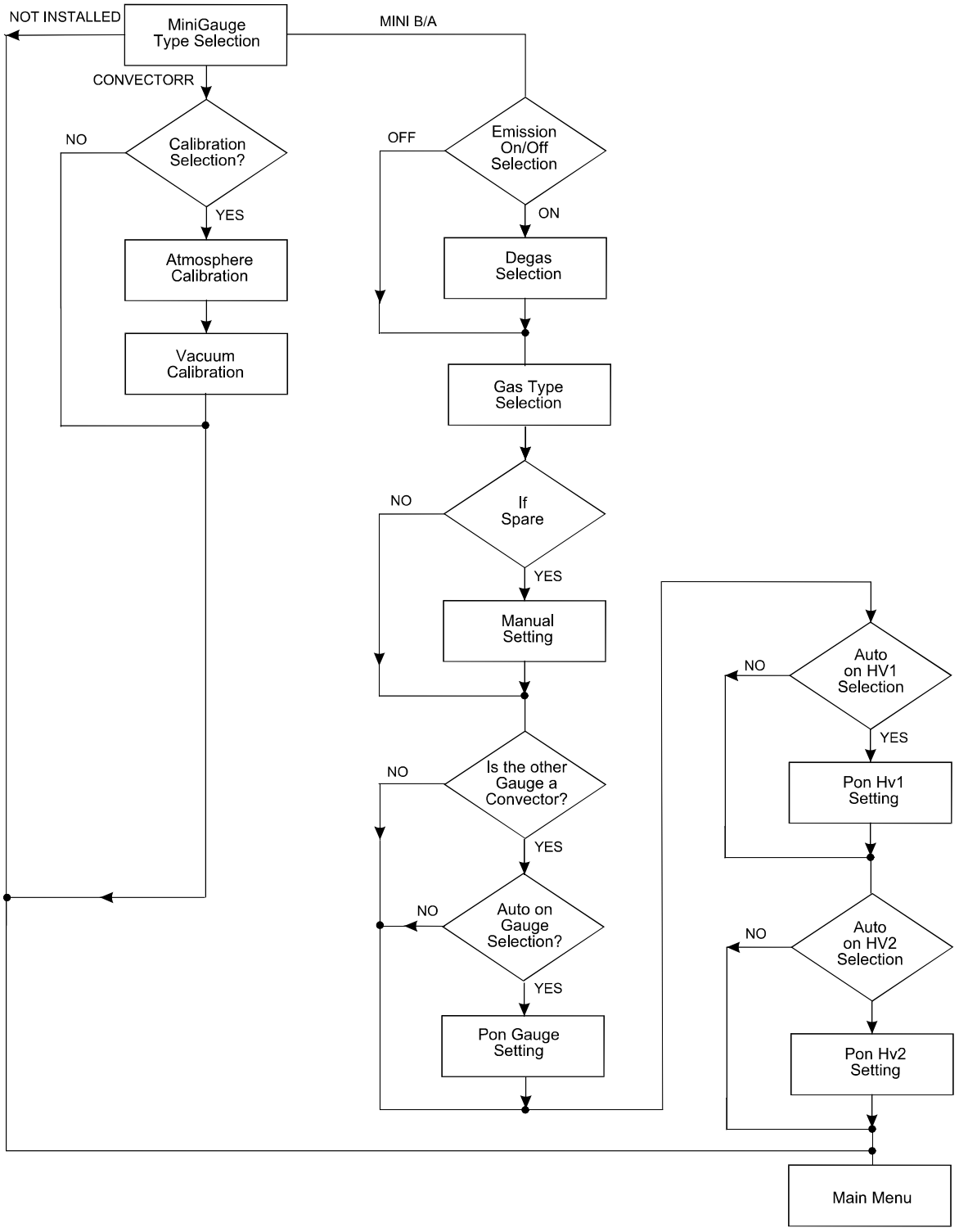
m	G	1				A	u	t	o	O	n		H	V	1
						N	O								*

Auto ON H.V. Pressure Threshold Select

m	G	1		P	o	n	H	V	1	(	T	o	r	r	)
		→	1	.	0		E	X	P		-	4			*

At this point the voltage values are displayed.

The detailed sequence can be seen in the following flow chart:



Messages Associated to the Menu Button Related to the Serial Channel

The serial menu described below can be accessed if SERIAL was selected during the channel selection phase.

As for the previous menu, also in this case you can use the CHANGE button to change the parameters and the ENTER button to confirm them.

Baud Rate Selection

S	**C**	**1**					**B**	**A**	**U**	**D**		**R**	**A**	**T**	**E**
						9	**6**	**0**	**0**						

It is possible to select between 9600, 4800, 2400, and 1200

Address Selection

S	**C**	**1**		**A**	**D**	**D**	**R**	**E**	**S**	**S**		**N**	**O**	**D**	**E**
							1								*

Parity Selection

S	**C**	**1**								**P**	**A**	**R**	**I**	**T**	**Y**
						N	**O**	**N**	**E**						*

The following values can be chosen:

NONE
ODD
EVEN

SERIAL INTERFACE

General

After having described the connector and the pinouts in the different configurations, this section provides information on Dual controller's serial interface. In particular, bear in mind that compatibility with the existing protocols on the MultiVac (Binary and ASCII) has been maintained as far as the data format and different commands are concerned. Furthermore, a new protocol called *MultiGauge Compatible* is introduced. It derives from the *Mini B/A Eye Sys* specifications and implements the data format above all, while the majority of the commands are new.

General Definitions of the Hardware Protocol

The Dual controller implements the following data exchange protocols:

Binary	Derived from the MultiVac's binary protocol
Ascii	Derived from the MultiVac's ASCII protocol
MultiGauge Compatible Protocol	Derived from the protocol used for the MiniGauge Eyesys

With respect to the three native protocols, compatibility is guaranteed at format level (header, terminator, checksum, etc.), while the different commands are implemented in compliance with the characteristics of the Dual controller.

Hardware Signals Management

The RX, TX and GND signals are present on the data exchange line.

There is no flow control implemented through RTS/CTS and the DTR and DSR signals are not handled.

The RS232, RS422 and RS485 physical interfaces are implemented.

NOTE

The RS485 requires software addressing and therefore a binary protocol is needed.

Transmission Format and Timeout

The serial data transmission parameters are listed below:

Speed	1200-2400-4800-9600 baud[1]
Start bit	1
Stop bit	1
Data bit	8
Parity	None, Odd, Even

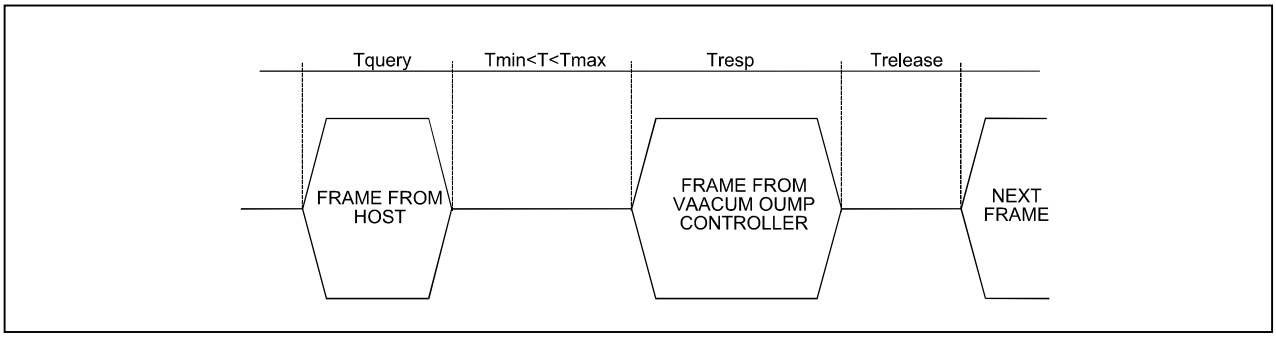
[1] All the baud rates indicated are supported; the default rate is 9600.

Data exchange is performed in the Half-Duplex mode. To guarantee a synchronized data flow and to prevent conflicts, the timings indicated in the table below must be respected:

Treset	Maximum delay between consecutive bytes of the same data packet. The controller can reinitialize reception if this time frame expires without data exchange.	2 byte time[2]
Tmin	Minimum time frame before a reply can be initiated. The controller's reply message cannot begin until the expiry of this time frame, which is initiated at the end of the Host message.	4 msec
Tmax	Maximum time frame within which a reply can be given. The controller's reply message cannot begin until the expiry of this time frame, which is initiated at the end of the Host message.	100 msec
Tquery	Minimum time frame for query transmission.	nº byte x byte time
Tresponse	Minimum time frame for reply transmission.	nº byte x byte time
Trelease	Maximum time frame within which the RS485 line can be freed. Within this time frame the controller must free the serial line upon completion of reply transmission. Such time out is relevant in the RS485 mode only.	2 byte time

[2] Equivalent to the transmission time of a single byte at the selected baud rate and assumes the following values: 8.33 msec at 1200, 4.16 msec at 2400, 2.08 msec at 4800, 1.04 msec at 9600.

A data exchange session will therefore assume the timing shown in the following figure:



Timing

Data Exchange Error Management

The following data exchange errors are handled (during reception by the controller):

Error Type	Possible Cause
Overrun	Problems with the Dual controller's data exchange driver
Frame error	Line noise, incorrect baud rate or data corruption
Checksum error	Data corruption (not on the MultiGauge Protocol)
Full buffer	Too many bytes or data corruption
Bad header	Inexistant or incorrect header
Time-out	Unrespected time out (Treset)

When a data exchange error occurs, the Dual controller does not react in any way to the command received but replies with an NACK message except in cases when an RS485 serial line is used.

If an unrecoverable error (crash error) occurs on the Dual controller, the serial line will not be able to handle any type of data exchange.

SOFTWARE PROTOCOL

The Dual controller automatically detects the type of software protocol used by analyzing the header and provides its related reply.

The three protocols have equivalent data fields which comply with the following formats:

Type	No. of Bytes.	Description
Read	1	"?" (3Fh[3]) performs reads on the Dual controller
Status	1	"0" (30h) = false = off, "1" (31h) = true = on [5]
Integer	5	"xxxxx" represented in BCD[4] on 5 digits (always positive)
BitField	8	Like the integer type, but with meanings associated to the number's single bits
Expo-nential	7	"x.xEsxx" where x is BCD digits, E is the 45h character and s is the ("+" o "-" sign
String	n	Sequence of n characters included within the 20h and 7Fh range

[3] the "h" notation following a number indicates that the number is expressed in hexadecimal format

[4]BCD: the number is represented by digits included within the "0" and "9" range (ASCII 30h - 39h).

[5]Status can also assume values greater than "1".

The commands have a read and a write mode. By specifying the type of read operation being performed, the Host queries the Dual controller which in turn replies in a format compliant with the command sent. As long as a write operation can be carried out, the write and read formats for the same command coincide.

The write modes will have the following possible replies:

- ACK command correctly received and executed: run a query to check that the value has been written (typical for High Voltage/Gauge power on/power off)
- Error unexecutable command due to a context error (“!” 21h) (see Protocol Errors)
- Value command received and executed: the value is immediately returned in the same format of the write command (the query is not required).

The commands are associated to the channel which is specified in the Channel field. The following table indicates the values that can be assigned in this field:

Value		Channel	Description
“0”	30h	No channel	The command does not act on any specific channel but overall on the entire Dual controller (e.g. firmware version read)
“1”	31h	High Voltage 1	The command acts on a Channel 1 corresponding to the High Voltage 1 module
“2”	32h	High Voltage 2	The command acts on a Channel 2 corresponding to the High Voltage 2 module
“3”	33h	Gauge1	The command acts on a Channel 3 corresponding to the MiniGauge 1 module
“4”	34h	Gauge2	The command acts on a Channel 4 corresponding to the MiniGauge 2 module
“5”	35h	Serial	The command acts on a Channel 5 corresponding to the Serial Communication module

Furthermore, the physical measurements visible from the serial line will always have the related unit of measure indicated. This applies, above all, for pressure measurements that are not subject to the settings made on the Dual controller.

NOTE

The RS485 mode is normally used in a data exchange network where the software addressing of the different nodes connected (maximum 32) is only made possible by means of the binary protocol. Therefore in the RS485 mode, the Dual controller will only recognize the binary protocol and will ignore any data exchange performed using the ASCII and MultiGauge Compatible Protocol.

In the Remote I/O mode, only the commands present on the digital outputs of the Remote I/O (Fixed/Step, Local/Remote, Start/Protect, pump on/off) are read-only active.

The write commands are enabled in the automatic mode only. In addition, the remote mode cannot be selected during a menu editing phase using the front panel.

Binary Protocol

Host to Dual controller command format:

[header command] [length] [command] [channel] [data] [checksum]

Dual controller to Host reply format:

[header response] [length] [command] [channel] [data] [checksum]

Field	No. of bytes	Value	Description
Header command	1	81h 81h÷A0h	Header for the serial RS232, RS422 Header and address for the serial RS485 (129 - 160)
Header response	1	01h 01h÷20h	Header for the serial RS232, RS422 Header and address for the serial RS485
Length	2		Data packet length in BCD (command, channel, data fields only)
Command	2		See commands description (byte 0 command, byte 1 subcommand)
Channel	1	30h 31h 32h 33h 34h 35h	No channel High Voltage 1 High Voltage 2 Gauge 1 Gauge 2 Serial Communication
Data	n		See commands description
Checksum	1		XOR of all bytes (checksum excluded) in *and* with 7Fh

ASCII Protocol

Host to Dual controller command format:

[header command] [length] [command] [channel] [data] [checksum]

Dual controller to Host reply format:

[header response] [length] [command] [channel] [data] [checksum]

Field	No. of bytes	Value	Description
Header command	1	40h	Header “@”
Header response	1	24h	Header “$”
Length	2		Data packet length in BCD (command, channel, data fields only)
Command	2		See commands description (byte 0 command, byte 1 subcommand)
Channel	1	30h 31h 32h 33h 34h 35h	No channel High Voltage 1 High Voltage 2 Gauge 1 Gauge 2 Serial Communication
Data	n		See commands description
Checksum	4		Sum of all bytes (checksum excluded) represented in BCD

MultiGauge Compatible Protocol

Host to Dual controller command format:

[header command] [channel] [command] [data] [terminator]

Dual controller to Host reply format:

[header response] [channel] [command] [data] [terminator]

where:

Field	No. of Bytes	Value	Description
Header command	1	23h	Header "#"
Header response	1	3Eh	Header ">"
Channel	1	30h 31h 32h 33h 34h 35h	No Channel High Voltage 1 High Voltage 2 Gauge 1 Gauge 2 Serial Communication
Command	2		See commands description
Data	n		See commands description
Terminator	1	0Dh	Carriage Return

Following are shown a typical command with the answers of the DUAL in the three different formats. The command is the status at the the High Voltage 1:

Binary Protocol:

ü 04 A01 ? Z
81h 30h 34h 41h 30h 31h 3Fh 7Ah

• 04 A01 0 u
1h 30h 34h 41h 30h 31h 30h 75h

Ascii Protocol:

@ 04 A0 ? 0389
40h 30h 34h 41h 30h 31h 3Fh 30h 33h 38h 39h

$ 04 A01 0346
24h 30h 34h 41h 30h 31h 30h 33h 34h 36h

Multigauge Compatible Protocol:

1 30 ?
23h 31h 33h 30h 3Fh Dh

> 1 30 0
3Eh 31h 33h 30h 30h Dh

LIST OF COMMANDS

The commands that have been implemented are described in the following tables:

General Commands

Command	Description	Mode	Channels	Format	Possible Values
Local/remote	Local or serial operating mode	Read/Write	No channel	Status	30h local 31h Remote I/O 32h serial
HV on/off	On/off High Voltage	Read/Write	HV1, HV2	Status	See HV on/off command in the codes table
Unit of measure	Unit of measure on Dual controller	Read/Write	No channel	Status	30h Torr 31h mBar 32h Pascal
µC firmware version	µC (micro central) firmware version	Read	No channel	String	18 characters e.g. “VPo 1 0 24/04/98”
DSP firmware version	Versione firmware DSP (micro HV)	Read	No channel	String	16 characters e.g. “VPd 1 0 24/04/98”
Device number	Pump number set on the specified channel	Read/Write	HV1, HV2 Gauge1, Gauge2 Serial	Status	See device table
Device type	Type of device set on the specified channel	Read	Channel no. HV1, HV2 Gauge1, Gauge2 Serial	String	See device table
V meas	Voltage measurement	Read	HV1, HV2	Integer (V)	“00000” if powered off
I meas	Current measurement	Read	HV1, HV2	Exp. (A)	“0 0E+00” if powered off
Pr meas	Pressure measurement	Read	HV1, HV2 Gauge1, Gauge2	Exp. (Torr)	“0 0E+00” if powered off
Dual Controller Error Status	Reads the error status on the selected channel	Read	HV1, HV2 Gauge1, Gauge2 Serial no channel	Integer	See Error Status Table
Serial reset	Resets the Dual controller	Write[1]	No channel	Status	30h not ok, no reset 31h ok, reset performed
Remote error	Error returned by the Dual controller due to an invalid data exchange	Reply	No channel	Integer	See the Protocol error table
Interlock Status	Reads the status of the interlocks	Read	No channel	BitField	See the Interlock table

[1] DUAL Controller doesn't reply to this command.

Command Code Value

Command Name **General Usage Commands**	**Binary**		**ASCII**		***MultiGauge Compat Protocol***	
	ascii	**hex**	**ascii**	**hex**	**ascii**	**hex**
local/remote	Z0	5Ah30h	Z0	5Ah30h	10	31h30h
HV on/off	A0	41h30h	A0	41h30h	30	30h30h
Unit of measure	D0	44h30h	D0	44h30h	03	30h33h
µc firmware version	E0	45h30h	E0	45h30h	05	30h35h
Dsp firmware version	E1	66h30h	E1	66h30h	04	30h34h
device number	F0	46h30h	F0	46h30h	01	30h31h
device type	F1	46h30h	F1	46h30h	11	31h31h
V meas	S0	53h30h	S0	53h30h	07	30h37h
I meas	T0	54h30h	T0	54h30h	08	30h38h
Pr meas	U0	55h30h	U0	55h30h	02	30h32h
Vacuum Pump Controller error status	z0	7Ah30h	z0	7Ah30h	19	31h39h
Serial reset	[0	5Bh30h	[0	5Bh30h	06	30h36h
remote error	!0	21h30h	!0	21h30h	12	31h32h
Interlock status	]0	5Dh30h	]0	5Dh30h	13	31h33h

HV on/off Command Coding

Mode	**Code**		**Description**
Write	0	30h	HV power off
Write	1	31h	HV power on (in compliance to the Start/Protect and Fixed/Step selection made using the related commands)
Read	0	30h	HV off
Read	1	31h	HV on
If *full compatible MultiVac*			
Read	1	31h	HV on in start/step V
Read	2	32h	HV on in start/fixed V
Read	3	33h	HV on in protect/step V
Read	4	34h	HV on in protect/fixed V
Read	-3	2Dh33h	Power off caused by Interlock Panel
Read	-4	2Dh34h	Power off caused by Remote I/O Interlock
Read	-3	2Dh33h	Power off caused by Cable Interlock
Read	-8	2Dh38h	Power off caused by HV Overtemperature
Read	-7	2Dh37h	Power off caused by Remote I/O not Present or Remote I/O Fault
Read	-6	2Dh36h	Power off caused by HV Protect
Read	-7	2Dh37h	Power off caused by HV Short Circuit

Device Number and Device Type Commands Coding

Channel	Device number		Device type
HV1, HV2	0	30h	Spare
HV1, HV2	1	31h	500 SC/Tr
HV1, HV2	2	32h	300 SC/Tr
HV1, HV2	3	33h	150 SC/Tr
HV1, HV2	4	34h	75-55-40SC/T
HV1, HV2	5	35h	20 SC/Tr
HV1, HV2	6	36h	500 Diode/ND
HV1, HV2	7	37h	300 Diode/ND
HV1, HV2	8	38h	150 Diode/ND
HV1, HV2	9	39h	75-55-40 D/ND
HV1, HV2	10	3Ah	20 -25 Diode/ND
Gauge1, Gauge2	0	30h	Convectorr
Gauge1, Gauge2	1	31h	Mini-B/A
Gauge1, Gauge2	2	32h	Cold Cathode
Serial	0	30h	RS232/422
Serial	1	31h	RS485

NOTE

When reading, if the required device is missing, DUAL replies: "?" (3Fh).

Interlock Status Coding

BitField	Interlock type (active if 1)
01h	Reserved (always 0)
02h	Front Panel Interlock (equal to bit 20h)
04h	HV1 Remote I/O Interlock
08h	HV1 Cable interlock
10h	Reserved (always 0)
20h	Front Panel Interlock (equal to bit 20h)
40h	HV2 Remote I/O Interlock
80h	HV2 Cable interlock

In the following example shown the use of the command HV ON/OFF to power up the channel 1 in the three protocols.

Binary Protocol:

ü 04 A0 1 1 +
81h 30h 34h 41h 30h 31h 31h 74h

ACK
6h

Ascii Protocol:

@ 04 A0 1 1 0375
40h 30h 34h 41h 30h 31h 31h 30h 33h 37h 35h

ACK
6h

Multigauge Compatible Protocol:

1 30 1
23h 31h 33h 30h 31h Dh

ACK
6h

NOTE

The answer ACK or 6h is given only if the mode ACK NACK is selected, if not with this type of command, nothing is provided by the DUAL.

The following example command is used to read the current of the channel 1 or 2.

Binary Protocol:

ü 04 T02 ? 1 |
81h 30h 34h 54h 30h 32h 3Fh 6Ch

• 10 T02 8.9E – 04 □
1h 31h 30h 54h 30h 32h 38h 2Eh 39h 45h 2Dh 30h 34h 15h

Ascii Protocol:

@ 04 T02 ? 0409
40h 30h 34h 54h 30h 32h 3Fh 30h 34h 30h 39h

$ 10 T0 2 4.4 E-04 0679
24h 31h 30h 54h 30h 32h 34h 2Eh 34h 45h 2Dh 30h 34h 30h 36h 37h 39h

Multigauge Compatible Protocol:

1 0 8 ?
23h 31h 30h 38h 3Fh Dh

> 1 08 1.9 E - 04
3Eh 31h 30h 38h 31h 2Eh 39h 45h 2Dh 30h 34h Dh

High Voltage Commands

Command	Description	Mode	Channels	Format	Possible values
fixed/step	fixed/step mode	Read Write	HV1, HV2	Status	30h fixed 31h step
start/protect	start/protect mode	Read Write	HV1, HV2	Status	30h start 31h protect
Psel	Power supply polarity	Read	HV1, HV2	Status	30h negative 31h positive
Vmax	Vmax variable	Read Write	HV1, HV2	Integer (V)	[3000, 7000] step 100
Imax	Imax variable	Read Write	HV1, HV2	Integer (mA)	[100, 400] step 10
Pmax	Pmax variable	Read Write	HV1, HV2	Integer (W)	[100, 400] step 10
Iprotect	Iprotect variable	Read Write	HV1, HV2	Integer (mA)	[10, 100] step 10
Vstep1	Vstep1 variable	Read Write	HV1, HV2	Integer (V)	[3000, 7000] step 100
Istep1	Istep1 variable	Read Write	HV1, HV2	Exp. (A)	[1.0E-9, 1.0E1]
Vstep2	Vstep2	Read Write	HV1, HV2	Integer (V)	[3000, 7000] step 100
Istep2	Istep1 variable	Read Write	HV1, HV2	Exp. (A)	[1.0E-9, 1.0E1]
SetPt1	SetPt1 variable (Set Point 1)	Read Write	HV1, HV2	Exp. (Torr)	[1.0E-9, 1.0E1] (have to be greater than SP2)
SetPt2	SetPt2 variable (Set Point 2)	Read Write	HV1, HV2	Exp. (Torr)	[1.0E-9, 1.0E1]
Remote I/O Output	Reads the status of the Remote I/O outputs	Read	HV1, HV2	BitField	See Remote I/O table
Remote I/O Input	Reads the status of the Remote I/O inputs	Read	HV1, HV2	BitField	See Remote I/O table

High Voltage Commands

Command Name **General Usage Commands**	**Binary**		**ASCII**		***MultiGauge Compat. Protocol***	
	ascii	**hex**	**ascii**	**hex**	**ascii**	**hex**
fixed/step	B0	42h30h	B0	42h30h	60	36h30h
start/protect	C0	43h30h	C0	43h30h	61	36h31h
Psel	G0	47h30h	G0	47h30h	62	36h32h
Vmax	H0	48h30h	H0	48h30h	63	36h33h
Imax	I0	49h30h	I0	49h30h	64	36h34h
Pmax	J0	4Ah30h	J0	4Ah30h	65	36h35h
Iprotect	K0	4Bh30h	K0	4Bh30h	66	36h36h
Vstep1	L0	4Ch30h	L0	4Ch30h	67	36h37h
Istep1	M0	4Dh30h	M0	4Dh30h	68	36h38h
Vstep2	N0	4Eh30h	N0	4Eh30h	69	36h39h
Istep2	O0	4Fh30h	O0	4Fh30h	70	37h30h
SetPt1	P0	50h30h	P0	50h30h	71	37h31h
SetPt2	Q0	51h30h	Q0	51h30h	72	37h32h
Remote I/O Output	g0	67h30h	g0	67h30h	73	37h33h
Remote I/O Input	h0	68h30h	h0	68h30h	74	37h34h

Remote I/O Commands Coding

bitField	**Remote I/O input**	**Remote I/O output**
01h	id. I/O board (always 1)	High Voltage enable
02h	I/O board OK (always 1)	Set Point2 active
04h	Step mode	Set Point1 active
08h	Remote mode	Interlock active
10h	Protect mode	High Voltage fault
20h	Output HV enable	Remote mode or Local mode (0) - Serial mode (1)
40h	Confirm HV on	Protect mode
80h	Remote I/O interlock	Not used (always 0)

The following example shows the reading on the High Voltage 1, the status of the Start/Protect.

Binary Protocol:

ü 04 C01 ? X
81h 30h 34h 43h 30h 31h 3Fh 78h

• 04 C0 1 0 W
1h 30h 34h 43h 30h 31h 30h 77h

Ascii Protocol:

@ 04 C0 1 ? 0391
40h 30h 34h 43h 30h 31h 3Fh 30h 33h 39h 31h

$ 04 C0 1 0 0348
24h 30h 34h 43h 30h 31h 30h 30h 33h 34h 38h

Multigauge Compatible Protocol:

1 61 ?
23h 31h 36h 31h 3Fh Dh

> 1 61 0
3Eh 31h 36h 31h 30h Dh

MiniGauge Commands

Command	Description	Mode	Channels	Format	Possible Values
emiss	Emission on/off	Read Write	Gauge 1, Gauge 2	Status	30h emiss Off 31h emiss On 32h emiss Auto Mini B/A and ColdCathode only
degas on/off	Mini B/A degas mode	Read Write	Gauge 1, Gauge 2	Status	30h off 31h on Mini B/A only
gas correction	Gas Correction value	Read Write	Gauge 1, Gauge 2	Integer	[10, 999] Mini B/A only
auto on	*Emission auto on* mode	Read Write	Gauge 1, Gauge 2	Status	30h disable 31h enable ConvecTorr only
auto on value	*Emission auto on* value	Read Write	Gauge 1, Gauge 2	Exp. (Torr)	[1.0E-2, 1.0E1] ConvecTorr only
auto on hv1	*Auto on High Voltage 1* mode	Read Write	Gauge 1, Gauge 2	Status	30h disable 31h enable Mini B/A and ColdCathode only
auto on value hv1	*Auto on High Voltage 1* value	Read Write	Gauge 1, Gauge 2	Exp. (Torr)	[1.0E-8, 1.0E1] Mini B/A and ColdCathode only
auto on hv2	*Auto on High Voltage 2* mode	Read Write	Gauge 1, Gauge 2	Status	30h disable 31h enable Mini B/A and ColdCathode only
auto on value hv2	*Auto on High Voltage 1* value	Read Write	Gauge 1, Gauge 2	Exp. (Torr)	[1.0E-8, 1.0E1] Mini B/A and ColdCathode only

MiniGauge Commands

Command Name **General Usage Commands**	**Binary**		**ASCII**		***MultiGauge Compat. Protocol***	
	ascii	**hex**	**ascii**	**hex**	**ascii**	**hex**
emiss	i0	69h30h	i0	69h30h	52	35h32h
degas on/off	a0	61h30h	a0	61h30h	40	34h30h
gas correction	c0	63h30h	c0	63h30h	50	35h30h
auto on	d0	64h30h	d0	64h30h	53	35h33h
auto on value	e0	65h30h	e0	65h30h	54	35h34h
auto on hv1	I0	6Ch30h	I0	6Ch30h	55	35h35h
auto on value hv1	m0	6Dh30h	m0	6Dh30h	56	35h36h
auto on hv2	n0	6Eh30h	n0	6Eh30h	57	35h37h
auto on value hv2	o0	6Fh30h	o0	6Fh30h	58	35h38h

The following example shows how to turn on the eyesys mini B/A GAUGE on the channel 3.

Binary Protocol:

ü 04 i0 3 1 ^
81h 30h 34h 69h 30h 33h 31h 5Eh

ACK
6h

Ascii Protocol:

@ 04 i0 3 1 0417
40h 30h 34h 69h 30h 33h 31h 30h 34h 31h 37h

ACK
6h

Multigauge Compatible Protocol:

3 52 1
23h 33h 35h 32h 31h Dh

□

6h

Configuration Commands

The following commands are enabled in the configuration mode only. This mode is accessed through the *serial property* command, enabling the configuration; reset the system to exit.

Command	Description	Mode	Channels	Format	Possible Values
serial config	Enables write access to the configuration parameters	Read Write	No channel	Status	30h normal mode 31h serial configuration mode
serial property	Serial protocol characteristics	Read Write	No channel	bitField	See the protocol properties table
short circuit volt	Short circuit voltage	Read Write	No channel	Integer	[1, 7000]
short circuit current	Short circuit current	Read Write	No channel	Integer (mA)	[1, 400]
short circuit time	Short circuit intervention time	Read Write	No channel	Integer (s)	[10, 6000] step 10 expressed in ms x10
protect time	Protect intervention time	Read Write	No channel	Integer (s)	[10, 6000] step 10 expressed in ms x10
protect delay	Protect at power on function enable delay time	Read Write	No channel	Integer	[10, 6000] step 10 expressed in ms x10
prDeita1	f(I, V) = Pressure calculation constant	Read Write	No channel	Exp.	[0.0, 10.0]
prDeita2	f(I, V) = Pressure calculation constant	Read Write	No channel	Exp.	[0.0, 10.0]
P100nA	Pressure value at 5000V with I=100nA	Read Write	HV1, HV2	Exp. (Torr)	[1.0E-15, min(1.1E-9, P1µA)]
P1µA	Pressure value at 5000V with I=1µA	Read Write	HV1, HV2	Exp. (Torr)	[P100nA, P10µA] in read on SPARE pump
P10µA	Pressure value at 5000V with I=10µA	Read Write	HV1, HV2	Exp. (Torr)	[max(1.2E-9, P10µA), min(7.4E-8, P100µA]
P100µA	Pressure value at 5000V with I=100µA	Read Write	HV1, HV2	Exp. (Torr)	[P10µA, P1mA] in read on SPARE pump
P1mA	Pressure value at 5000V with I=1mA	Read Write	HV1, HV2	Exp. (Torr)	[P100µA, P10mA] in read on SPARE pump
P10mA	Pressure value at 5000V with I=10mA	Read Write	HV1, HV2	Exp. (Torr)	[max(7.5E-8, P1mA), min(7.4E-5, P100mA]
P100mA	Pressure value at 5000V with I=100mA	Read Write	HV1, HV2	Exp. (Torr)	[P10mA, P400mA] in read on SPARE pump
P400mA	Pressure value at 5000V with I=400mA	Read Write	HV1, HV2	Exp. (Torr)	[max(7.5E-5, P100mA), 1.0E2]
reinitialize eeprom	Reloads the defaults in EEPROM	Write[1]	No channel	Status	1 reloads the defaults in EEPROM
setpoint histeresys %	Histeresys percentage range of the setPoint Remote I/O value	Read Write	No channel	Integer (%)	[0,100] step 1

[1] DUAL Controller doesn't reply to this command and the display will show SYSTEM ERR 5, turn off and on the power to reset the error.

Command Name **General Usage Commands**	**Binary**		**ASCII**		***MultiGauge Compat. Protocol***	
	ascii	**hex**	**ascii**	**hex**	**ascii**	**hex**
serial config mode	xa	78h61h	xa	78h61h	80	38h30h
serial property	xb	78h62h	xb	78h62h	81	38h31h
short circuit volt	xc	78h63h	xc	78h63h	82	38h32h
short circuit current	xd	78h64h	xd	78h64h	83	38h33h
short circuit time	xe	78h65h	xe	78h65h	84	38h34h
protect time	xf	78h66h	xf	78h66h	85	38h35h
protect delay	xg	78h67h	xg	78h67h	86	38h36h
prDelta1	xh	78h68h	xh	78h68h	87	38h37h
prDelta2	xi	78h69h	xi	78h69h	88	38h38h
P100nA	xj	78h6Ah	xj	78h6Ah	89	38h39h
P1µA	xk	78h6Bh	xk	78h6Bh	90	38h30h
P10µA	xl	78h6Ch	xl	78h6Ch	91	39h31h
P100µA	xm	78h6Dh	xm	78h6Dh	92	39h32h
P1mA	xn	78h6Eh	xn	78h6Eh	93	39h33h
P10mA	xo	78h6Fh	xo	78h6Fh	94	39h34h
P100mA	xp	78h70h	xp	78h70h	95	39h35h
P400mA	xq	78h71h	xq	78h71h	96	39h36h
reinitialize eeprom	xr	78h72h	xr	78h72h	97	39h37h
setPoint histeresys%	xs	78h73h	xs	78h73h	98	38h38h

Serial Property Commands Coding

bitField	**bit at 0**	**bit at 1**
01h	Disables full compatible MultiVac	Enables full compatible MultiVac
02h	Disabled reply on Write	Enables reply on Write
04h	Disables Ack/Nack mode	Enables Ack/Nack mode
08h	Disables multiple commands	Enables multiple commands
10h	Disables automatic serial mode	Enables automatic serial mode
20h	Not used	Not used
40h	Parity bit 0 (read only)	Parity coding
80h	Parity bit 1 (read only)	0=none, 1=odd, 2=even, 3=not valid

The following example shows a reading of the serial property.

Binary Protocol:

ü 04 xb 0 ? □
81h 30h 34h 78h 62h 30h 3Fh 1h 0h

• 1 1 xb 0 00000100
1h 31h 31h 78h 62h 30h 30h 30h 30h 30h 30h 31h 30h 30h 2Ah

Ascii Protocol:

@ 04 xb 0 ? 0493
40h 30h 34h 78h 62h 30h 3Fh 30h 34h 39h 33h

$ 11 xb 0 00000100 0785
24h 31h 31h 78h 62h 30h 30h 30h 30h 30h 30h 31h 30h 30h 30h 30h 37h 38h 35h

Multigauge Compatible Protocol:

0 81 ?
23h 30h 38h 31h 3Fh Dh

> 0 81 00000100
3Eh 30h 38h 31h 30h 30h 30h 30h 31h 30h 30h Dh

The answer means that the unit is in ACK/NACK mode.

Protocol Errors

If incongruencies are detected in the composition of the data packet sent to the Dual controller (in other words a correct reception but an incorrect data format), the Dual controller will reply with an error code identified by the "!" (21h) command according to the following table.

Value		Description	Value in full comp. MV	
"1"	31h	Reserved (checksum error)	"0"	30h
"2"	32h	Non existent command code	"1"	31h
"3"	33h	Channel not valid for the selected command	"2"	32h
"4"	34h	Write mode not allowed for the selected command	"4096"	34h30h39h36h
"5"	35h	Unvalid or non-congruent data transmitted	"4"	34h
"6"	36h	Write value exceeding the allowed limits or step not allowed	"16"	31h36h
"7"	37h	Data format not recognized on the protocols implemented	"1"	31h
"8"	38h	Write not allowed to channel ON	"64"	36h34h
"9"	38h	Write not allowed to channel OFF	"128"	21h32h38h
":"	3Ah	Write allowed in Serial Configuration Mode only	"4096"	34h30h39h36h

MultiVac Compatibile Serial Error Coding

Full compatible MV Value		Description
1	31h	Not used
2	32h	Error in the power supply unit code
4	34h	Parameter error
8	38h	Length error
16	31h36h	Out of limits error
32	33h32h	Unallowed step error
64	36h34h	Attempt to modify values with pump powered on
128	31h32h38h	Attempt to read measurements with pump powered off
256	32h35h36h	Pump fault error
512	35h31h32h	Intervention on non-existing pump error
1024	31h30h32h34h	Pump polarity error
2048	32h30h34h38h	Intervention on non-present remote I/O error
4096	34h30h39h36h	Write attempt made in "REMOTE COMM." mode
8192	38h31h39h32h	Modification allowed on SPARE pump only

In the following example is shown a bad command send to the DUAL.

Binary Protocol:

ü 04 A0 31 V
81h 30h 34h 41h 30h 33h 31h 76h

• 05 A0 3 !3 T
1h 30h 35h 41h 30h 33h 21h 33h 54h

Ascii Protocol:

$ 04 A0 3 1 0377
24h 30h 34h 41h 30h 33h 31h 30h 33h 37h 37h

$ 05 A0 3 !3 0385
24h 30h 35h 41h 30h 33h 21h 33h 30h 33h 38h 35h

Multigauge Compatible Protocol:
3 30 ?
23h 33h 33h 30h 3Fh Dh

> 3 00 ! 3
3Eh 33h 30h 30h 21h 33h Dh

Dual Controller Error Status

Value		Error type	Error reference
		High Voltage errors	
1	31h	High Voltage off due to front panel interlock activation	Panel Interlock
2	32h	High Voltage off due to Remote I/O interlock activation	Remote Interlock
3	33h	High Voltage off due to Cable HV interlock activation	Cable Interlock
4	34h	Dual fault	HV not found
5	35h	High Voltage off due to a general DSP determined fault	HV Fault
6	36h	High Voltage off due to an HV module overtemperature determined by the DSP	HV Overtemperature
7	37h	Remote I/O card not present or faulty	R.I/O not found
8	38h	Remote I/O card present, but faulty	R.I/O fault
9	39h	High Voltage off due to the protect function activation	Protect
10	31h30h	High Voltage off due to shortcircuit protection activation	Short Circuit
11	31h31h	High Voltage off due to an HV module overvoltage or overcurrent determined by the DSP	Over Volt/Curr
12	31h32h	High Voltage off due to the zero measurement protection activation	Zero Meas
		MiniGauge errors	
1	31h	MiniGauge off due to front panel interlock activation	Panel Interlock
2	32h	The selected Minigauge was not recognized	Gauge not found
3	33h	The Minigauge is signaling a Fault condition	Gauge fault
4	34h	The selected Minigauge was disconnected	Gauge not connected
		System errors	
1	31h	RAM failure: RAM diagnostics error	Software Error
2	32h	config register: incorrect value in the uC 68HC11 configuration register	Software Error
3	33h	test mode: invalid uC 68HC11 operating mode	Software Error
4	34h	copyright: violation of the signature in the ROM or the ROM was corrupted	Software Error
5	35h	eeprom fault: checksum or non-volatile memory write errors. Factory defaults are automatically loaded	Software Error
6	36h	version number: incompatible uC and Dsp versions	Software Error
7	37h	hv dsp not found: the Dsp does not respond during the uC initialization phase	Software Error
8	38h	dsp fault: the Dsp does not respond during normal operation	Software Error
9	39h	invalid option: option card not configured correctly	Software Error
10	31h30h	unknow option: generic execution error	Software Error

SPECIFIC PROTOCOL SETTINGS

Ack/Nack Mode

Setting the appropriate bit via the Serial Property command enables the Dual to transmit the Acknowledge (06h) flow control.

Write Reply

Setting the appropriate bit via the Serial Property command enables the Dual to provide a reply after a write command with the typical read communication.

Example:

HV power on:	[header]A011[chk]
reply (HV on):	[header]A011[chk]
reply (HV not on):	[header]A010[chk]

Multiple Commands

Setting the appropriate bit via the *Serial Property* command enables multiple command function. With this function, it is possible to transmit to the Dual query command sequences within the same data packet, by linking 1 up to 6 query commands to the *command-channel-data* fields.

In the case of multiple commands, the data format has the following limitations:

- Format errors in only one of the commands sent will cause an error with the entire packet
- With the multiple command it is not possible to read the strings (eg., software version)
- Multiple commands are not enabled with the Lexington protocol
- The query has to be as follows: [command][channel][data query (?)][8 byte space] [next command]….[chk]
- The reply data are collected in 12-byte packets as follows: [command][channel][data answer][n space]

Following is an example of a multiple command where a space is indicated with the letter s:

query: HV1 state, HV2 state, Vmax ch1, Vmax ch2:

[header]**A01?**ssssssss**A02?** ssssssss**H01?** ssssssss**H02?**ssssssss [chk]

reply HV1 off, HV2 on, Vmax ch1 5000V, Vmax ch2 7000V

[header]**A010**ssssssss**A021**ssssssss**H0105000** ssssssss**H0207000**ssss[chk]

Automatic Serial Mode

Setting the appropriate bit via the Serial Property command enables the automatic Serial Mode function. When the Dual receives a serial write command, it automatically switches to the Serial Mode state in which it can accept the serial command. If a read command is received instead, the operating mode remains unaltered.
If this bit is not set, the serial write command is not accepted (the reply will be an error code) and the Dual will remain in the selected operating mode (either Local or Remote I/O).

Compatibility with MultiVac

The Binary and ASCII protocols are implemented, for the most part, by the protocol used on the MultiVac but are characterized by certain differences consisting of new features and certain Dual controller structural variations with respect to the MultiVac.

The new features implemented are the following:

- Mnultiple commands
- Ack/Nack mode
- Reply on write mode
- Even and odd parity management
- New serial commands
- MiniGauge serial commands
- Configuration serial commands.

The structural variations mostly concern the command set and formats. In particular, it is not possible to make up for the differences resulting from the hardware implementation such as the presence of the HV microcontroller, the Remote I/O, the MiniGauge options and the configuration commands.

NOTE

These differences can be limited by using the Serial Property command to set the full compatibility MultiVac bit to 1. Its purpose is to render compatible the already existing programs but introduces certain limitations that advise against its use with new applications. In the case of a full compatibility MultiVac, the following settings will also be made:

- *Multiple command disable*
- *Reply on write disable*
- *Lexington protocol exclusion*

The following table lists the incompatibilities that remain even though full compatibility MultiVac has been set:

Command	**Modification**
HV on/off	Cannot be used on the gauges
Unit of measure	Also implements Pascal (02h reply)
µC firmware version	Identifier for: “VPc ver. 0.1”
Device number	Pump correspondence table modified
Dual error status	Returns the Dual error codes according to the table
Serial reset	Implemented on all versions
Full meas hv	Eliminated Was available on MultiVac 3.0 and later versions only (MultiGauge)
Full status	Eliminated Was available on MultiVac 3.0 and later versions only (MultiGauge)
Remote error	Partly implemented
Psel	Read only also on “Spare” pump

The following commands, therefore, remain unchanged:

HV on/off, V meas, I meas, Pr meas, fixed/step, start/protect, Vmax, Imax, Pmax, Iprotect, Vstep1, Istep1, Istep2, SetPt1, SetPt2, P100nA, P10uA, P10mA, P400mA.

The part relating to the Gauges will not guarantee compatibility since the Gauge cards implemented have been changed with respect to MultiVac.

In addition, configuration commands were unavailable on the MultiVac.

ACCESSORIES/OPTIONS

DESCRIPTION	PART NUMBER
Rack Adapter	929-0064
High Voltage cables:	
- H.V. bakeable cable, radiation resistant, 13 ft. (4 m) long, with Interlock	929-0705
- H.V. bakeable cable, radiation resistant, 13 ft. (4 m) long	929-0710
- H.V. bakeable cable, radiation resistant, 13 ft. (4 m) long, for vacIon Pumps	929-0712
Eyesys Convectorr gauge cable	929-0721
Eyesys Mini B/A gauge cable	929-0720
RS422 computer interface option	Ask for Modified Standard P/N
RS485 computer interface option	Ask for Modified Standard P/N
Eyesys gauges option	Ask for Modified Standard P/N

VARIAN

Request for Return

ISO 9001 REGISTERED

1. A Return Authorization Number (RA#) **WILL NOT** be issued until this Request for Return is completely filled out, signed and returned to Varian Customer Service.
2. Return shipments shall be made in compliance with local and international **Shipping Regulations** (IATA, DOT, UN).
3. The customer is expected to take the following actions to ensure the **Safety** of workers at Varian: (a) Drain any oils or other liquids, (b) Purge or flush all gasses, (c) Wipe off any excess residues in or on the equipment, (d) Package the equipment to prevent shipping damage, (for Advance Exchanges please use packing material from replacement unit).
4. Make sure the shipping documents clearly show the RA# and then return the package to the Varian location nearest you.

North and South America	**Europe and Middle East**	**Asia and ROW**
Varian Vacuum Technologies 121 Hartwell Ave Lexington, MA 02421 Phone : +1 781 8617200 Fax: +1 781 8609252	Varian SpA Via Flli Varian 54 10040 Leini (TO) – ITALY Phone: +39 011 9979111 Fax: +39 011 9979330	Varian Vacuum Technologies Local Office

CUSTOMER INFORMATION

Company name: ……

Contact person: Name: …… Tel: ……

Fax: …… E-Mail: ……

Ship Method: …… Shipping Collect #: …… P.O.#: ……

Europe only: VAT reg. Number: …… *USA only:* ☐ Taxable ☐ Non-taxable

Customer Ship To: …… Customer Bill To: ……

……

……

……

……

PRODUCT IDENTIFICATION

Product Description	Varian P/N	Varian S/N	Purchase Reference

TYPE OF RETURN *(check appropriate box)*

☐ Paid Exchange ☐ Paid Repair ☐ Warranty Exchange ☐ Warranty Repair ☐ Loaner Return
☐ Credit ☐ Shipping Error ☐ Evaluation Return ☐ Calibration ☐ Other ……

HEALTH and SAFETY CERTIFICATION

Varian Vacuum Technologies **CAN NOT ACCEPT** any equipment which contains **BIOLOGICAL HAZARDS** or **RADIOACTIVITY**. Call Varian Customer Service to discuss alternatives if this requirement presents a problem.

The equipment listed above (check one):

☐ **HAS NOT** been exposed to any toxic or hazardous materials

OR

☐ **HAS** been exposed to any toxic or hazardous materials. In case of this selection, check boxes for any materials that equipment was exposed to, check all categories that apply:

☐ Toxic ☐ Corrosive ☐ Reactive ☐ Flammable ☐ Explosive ☐ Biological ☐ Radioactive

List all toxic or hazardous materials. Include product name, chemical name and chemical symbol or formula.

……

Print Name: …… Customer Authorized Signature: ……

Print Title: …… Date: ……/……/……

NOTE: If a product is received at Varian which is contaminated with a toxic or hazardous material that was not disclosed, **the customer will be held responsible** for all costs incurred to ensure the safe handling of the product, and **is liable** for any harm or injury to Varian employees as well as to any third party occurring as a result of exposure to toxic or hazardous materials present in the product.

Do not write below this line

Notification (RA)#: …… Customer ID#: …… Equipment #: ……

VARIAN

Request for Return

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FAILURE REPORT

TURBO PUMPS and TURBOCONTROLLERS

☐ Does not start	☐ Noise	POSITION	PARAMETERS		
☐ Does not spin freely	☐ Vibrations	☐ Vertical	Power:	Rotational Speed:	
☐ Does not reach full speed	☐ Leak	☐ Horizontal	Current:	Inlet Pressure:	
☐ Mechanical Contact	☐ Overtemperature	☐ Upside-down	Temp 1:	Foreline Pressure:	
☐ Cooling defective		☐ Other:	Temp 2:	Purge flow:	
		……	OPERATION TIME:		

TURBOCONTROLLER ERROR MESSAGE:

ION PUMPS/CONTROLLERS

☐ Bad feedthrough	☐ Poor vacuum
☐ Vacuum leak	☐ High voltage problem
☐ Error code on display	☐ Other

Customer application:

VALVES/COMPONENTS

☐ Main seal leak	☐ Bellows leak
☐ Solenoid failure	☐ Damaged flange
☐ Damaged sealing area	☐ Other

Customer application:

LEAK DETECTORS

☐ Cannot calibrate	☐ No zero/high backround
☐ Vacuum system unstable	☐ Cannot reach test mode
☐ Failed to start	☐ Other

Customer application:

INSTRUMENTS

☐ Gauge tube not working	☐ Display problem
☐ Communication failure	☐ Degas not working
☐ Error code on display	☐ Other

Customer application:

PRIMARY PUMPS

☐ Pump doesn't start	☐ Noisy pump (describe)
☐ Doesn't reach vacuum	☐ Over temperature
☐ Pump seized	☐ Other

Customer application:

DIFFUSION PUMPS

☐ Heater failure	☐ Electrical problem
☐ Doesn't reach vacuum	☐ Cooling coil damage
☐ Vacuum leak	☐ Other

Customer application:

FAILURE DESCRIPTION

(Please describe in detail the nature of the malfunction to assist us in performing failure analysis):

NOTA: Su richiesta questo documento è disponibile anche in Tedesco, Italiano e Francese.
REMARQUE : Sur demande ce document est également disponible en allemand, italien et français.
HINWEIS: Auf Aufrage ist diese Unterlage auch auf Deutsch, Italienisch und Französisch erhältlich.

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Representative in most countries

VARIAN

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